(010)

Use of Wastewater for the Mass Growth of Microalgal Species *Chloroccoum aquaticum*

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Abstract

This study investigates the potential of *Chlorococcum aquaticum*, a green microalga, for wastewater treatment and biomass production. Although microalgae-based bioremediation is well established, limited studies have comparatively evaluated the performance of *C. aquaticum* across multiple real wastewater types under identical experimental conditions, particularly using locally available wastewater sources. Four types of wastewater-agricultural, automotive, domestic, and laboratory-were tested to assess algal growth and pollutant removal over 14 days. The experiment was conducted under controlled laboratory conditions, with a standardized initial inoculum concentration adjusted to an optical density (OD750) of 0.1. It was performed under normal daylight conditions with a uniform light regime to ensure comparability among treatments, and at room temperature (30±1 °C). Key parameters analyzed included Chemical Oxygen Demand (COD), Total Dissolved Solids (TDS), Dissolved Oxygen (DO), heavy metal content (lead, Pb), and pH levels. Automotive wastewater supported the highest algal biomass production, yielding 1.89 g of dry weight, followed by agricultural wastewater, which yielded 1.05 g. In contrast, domestic and laboratory wastewater showed lower growth rates, while the control culture (algae+BBM) produced the least biomass at 0.84 g. The study revealed significant reductions in COD across all wastewater types, with automotive wastewater showing the highest COD reduction from 523.2 mg/L to 345.9 mg/L. Lead (Pb) removal was most effective in automotive sewage, with a decrease of 0.305 mg/L, followed by agricultural wastewater at 0.27 mg/L. Dissolved oxygen levels increased due to algal photosynthesis, while pH remained relatively stable, ranging between 7.03 and 8.36 across wastewater types. Total dissolved solids (TDS) showed minor fluctuations, with agricultural wastewater exhibiting the highest TDS at 165 mg/L. The findings demonstrate that *Chlorococcum aquaticum* can thrive in nutrient-rich wastewater environments while effectively removing pollutants, including heavy metals and organic contaminants. Based on the measured physicochemical parameters, treated agricultural, domestic, and automotive wastewater complied with the permissible limits for land application and irrigation as stipulated by Central Environmental Authority (CEA) guidelines. The harvested algal biomass holds promise for applications such as biofuel production, animal feed, and organic fertilizers. Future research should focus on detailed biochemical characterization of the algal biomass and optimization of cultivation parameters to enhance large-scale wastewater treatment efficiency and resource recovery. This study highlights the sustainable benefits of microalgae-based wastewater treatment systems.

Keywords: *Chlorococcum aquaticum, Wastewater treatment, Heavy metal removal, Biomass production, COD reduction.*