TITLE: EFFECT OF GLUCOSE AMENDMENTS AND WASTEWATER-BORNE BACTERIA ON WASTEWATER-BASED ALGAE CULTIVATION SYSTEM

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ABSTRACT:

The microalgae biofuel production remains uneconomical considering the current low oil prices. Thus, in order to reduce the production costs of algal oil production the proposed strategy is to cultivate algae on wastewater-based media. In addition, such an approach is also a treatment alternative that add value to the residual wastewater (upcycling). The aim of this work was to compare the effect of wastewater-borne bacteria and glucose amendments on the growth performance of *Chlorella vulgaris* and *Pseudokirchineriella subcapitata* on domestic wastewater effluent. Algal culturing was carried out using fresh wastewater effluent produced by a secondary sewage treatment plant as the sole medium base. The effluent was kindly provided by EMBASA (Bahia State Agency for Domestic Wastewater Treatment, Salvador, Brazil). Algal growth on sterilized and non-sterilized treated domestic wastewater effluent was compared with and without N-nitrate and glucose supplementation (0.1 and 3 g l^{-1}, respectively).Trials were carried out at constant mixing (84 rpm), aeration (with 2.5% CO_2 supplementation), photoperiod of 12:12 light:dark cycles luminance of 174 µmol m^{2-1} s^{-1} at a controlled temperature of 25±1°C. Microalgae growth was monitored by optical density (OD680nm), total chlorophyll content, and pH. Algal biomass was tested for the presence of total lipids by chloroform/methanol (2:1) extraction approach. The presence of wastewater-borne bacteria decreased the total biomass and lipids of both microalgae (approximately 35% and 6%, respectively). The highest biomass productivity of *C vulgaris* and *P subcapitata* were 1.11 and 0.72 g l^{-1} on sterilized effluent amended with a combination of nitrogen and glucose, respectively. In addition, the combined supplementations of nitrate and glucose have favoured algal growth against the presence of wastewater-borne bacteria on non-sterilized treatments. However, algal mixotrophic growth on glucose showed distinct effect by either reduced lipid or increased protein content.

Keywords: microalgae, domestic wastewater, lipid, mixotrophic growth.

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