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Microalgae biomass growth using primary treated wastewater as nutrient source and their potential use for lipids production

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The great demand for energy, the rising price of the crude oil and the rapid decrease of the supply of fossil fuels are the main reasons that have increased the interest for the production of fuels from renewable resources. Microalgae are considered to be the most promising new source of biomass and biofuels, since their lipid content in some cases is up to 70%. The microalgal growth and its metabolism processes are essential in wastewater treatment with many economical prospects. The aim of this work was to evaluate the algal production in a laboratory scale open pond. The pond had a working volume of 30 L and was fed with sterilized primary treated wastewater. Chlorococcum sp. was used as a model microalgal. Experiments were conducted under controlled environmental conditions in order to investigate the removal of nutrients, biomass growth, and lipids accumulation in microalgae. Chlorococcum sp. cultures behavior was investigated under batch, fill and draw, and continuous operation mode, at two different radiation intensities (100 and 200 μmol/m2s). The maximum biomass concentration of 630 mg/L was observed with the fill and draw mode. Moreover, the growth rates of microalgal biomass were depended on the influent nutrients concentration. Specifically, the phosphates were the limiting factor for biomass growth in continuous condition; the phosphates removal in this condition, reached a 100%. Chemical demand oxygen (COD) was not removed efficiently by Chlorococcum sp. since it was an autotrophic microalgal with no organic carbon demands for its growth. The lipids content in the dry weight of Chlorococcum sp. ranged from 1 to 9% depending on the concentration of nutrients and the operating conditions.