Examining Productivity and Parameters for Growth of Chlorella Vulgaris in Effluent from Small-Scale Wastewater Systems for Potential Biofuel Production

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Septic systems and other small-scale waste-water processing systems do little to remove NH4+, NO3- and inorganic phosphorus from waste-water. Emission of the effluent from these systems can result in eutrophication of nearby bodies of water. Nitrogen and phosphorus are primary nutrients required for algae growth and exist in high concentrations in waste-water, thus waste-water provides a potential growth medium for algae. This research sought to determine if algae, specifically Chlorella vulgaris, could be utilized in small-scale waste-water treatment in order to lower harmful nutrient concentration and produce useful algal biomass. Algal biomass can be converted to biofuel, providing a potential source of income for small communities. By culturing algae at 21 °C , 16 °C , 28 °C , and 11 °C in an artificial wastewater medium and measuring algal growth, an effective growth season between April and mid-November was determined for the St. Louis area. Algae cultures grown in wastewater were shown to have specific growth rate constants ranging between .102 and .264. A maximum daily growth was recorded at .137 g/L/day, which falls within the parameters of other studies giving daily growth between .02 and .2 g/L/day. Specific growth rate constants in idealized mediums have been recorded between .42 and .69 in other studies using enclosed photobioreactors and idealized medium. This shows algal production in artificial wastewater to be suboptimal, but potentially viable. The ideal temperature for growth in artificial wastewater was found to be 21 °C and the percent changes in production at different temperatures were recorded.

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