

Microalgae bacteria biomass cultivation for wastewater treatment, biogas and bio-oil production

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Summary:

Microalgae are diverse group of prokaryotic and eukaryotic photosynthetic microorganisms growing rapidly due to their simple structure. Microalgae culture using wastewater enriched nutrients offers interesting wastewater treatments coupled with the production of potentially valuable biomass which can be used for multiple purposes. For wastewater treatments, algae-bacterial consortia received a particular attention for tropical and sub-tropical regions. Thus, Photosynthetic oxygenation by microalgae and pollutant degradation by bacteria are an attractive proposition for wastewater treatment. The synergetic activity of algal-bacterial consortia has the potential to improve organic carbon, nitrogen and phosphorous removal and reduce energy costs in wastewater treatments. Furthermore, with the potential for high biomass and oil productivities, microalgae have been investigated as the feedstock for the production of different biofuels including biodiesel, bio-ethanol, bio-hydrogen, bio-oil and biogas.

Microalgae cultivation using sunlight energy can be carried out in open or covered ponds or closed photobioreactors, based on tubular, flat plate or other designs. Open pond systems are shallow ponds in which algae and bacteria are cultivated and nutrients provided channeling directly wastewaters or the water from sewage/water treatment plants.

Algae and bacteria cultivation using wastewaters provide environmentally and economically valuable advantages:

- Environmental protection usually polluted by untreated water.**
- The reuse of the effluent treated water for irrigation, domestic uses (e.g. car cleanings, watering plants).**
- The production of bio-fertilizers usable for farming.**
- The production of biogas (e.g. methane) and bio-oils**

During my postdoctoral study in the department of “Environmental Engineering and Water Technology” at Uneco) Ihe Institute for Water Education in 2016, I focused my works on laboratory experiment on algae-bacteria cultivation using wastewater.

During this period,

- **Algae-bacterial biomass was successfully grown using urban wastewater as well as artificial wastewater. - Furthermore, wastewater was treated and important nutrient removed by algae and bacteria during the treatment process - Digestion method is now applied on the biomass for methane gas production and assessment.**

Based on the results of the study, algal or algae-bacterial biomass production using wastewater is a good opportunity for:

- **The reuse of treated wastewater for different purposes - biogas and bio-oil production and commercialization**
- **Bio-fertilizers production and commercialization - the financial empowerment of wastewater treatment plants in developing countries.**