Biofuels, bioenergy, environmental remediation

The University of Georgia Research Foundation, Inc.

Technology Commercialization Opportunity

Mixotrophic Algae and Their Consortia for the Production of Algae Biofuel Feedstock in Wastewater-fed Open Ponds

UGARF Case: 1454
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Intellectual Property Status: Patent Pending

Introduction

Most of the wastewaters that are rich in plant nutrients particularly nitrogen and/or phosphorus, are colored viz. carpet industry effluents, poultry litter, slaughter house wastes, dairy effluents, swine wastes, agricultural and other industrial wastes, municipal waste wastewater, compost plant/landfill leachates and biogas plant slurry. Metal micro-constituents and micro-particulates also cooperate to render coloration to wastewaters. These are free sources of water and cheap sources of nutrients for algal growth. However, their color adversely affects penetration of sunlight in water and thus the productivity of algae. Many algae are facultative heterotrophic and if available in water, they prefer an organic carbon substrate over undertaking photosynthesis. Generally this results into inhibition of photosynthesis in the presence of light. But there are algae that can simultaneously drive photoautotrophy and heterotrophy to achieve additive or synergistic effect of the two processes on their productivity and are called as mixotrophic forms. Consequently, the use of mixotrophic algae is especially attractive to decontaminate heavily polluted wastewaters and, simultaneously, provide high-yields of starting materials for the production of biofuels and organic chemicals of commercial interest.

Technology Summary

Using water heavily contaminated by poultry litter and wastewater from carpet industry as initial models, UGA scientists have developed a means to promote growth of mixotrophic algae in heavily colored wasterwaters. The mixotrophic algae of choice was comprised of a consortium of native, already acclimated, algae that displayed high growth rates. The method led to the selection of optimal combination of algae that are able to grow in dark/opaque wastewaters, using pollutants as nutrients and providing a steady supply of biomass for the production of biofuels and biomaterials.

Advantages

- Environmentally friendly, with the dual purpose of conducting effluent decontamination and producing biomass of commercial interest
- Does not require artificial light sources
- Allows for the selection of optimal combination of native algae for growth under local environmental conditions
- Does not require acclimatization of algae

Potential Applications

- Decontamination of hydrologic systems with the simultaneous steady production of biomass

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