



Technology Commercialization Opportunity

A Novel Algal Production Technology for Biofuel, Bioenergy and Added Value Products

UGARF Case: 1452

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Intellectual Property Status: Patent Pending

Introduction

Algae offer the most feasible biofuel option as this has been thoroughly assessed by many research groups. However, the available technology is marred with the high cost of production and also the fear of competition for scarce resources such as water and N- and P- fertilizers. Further, energy investment to produce algal biomass also needs to be lowered down so as to make it cost effective. The investments are still high for harvesting algae suspended in water.

Conventionally, algae are grown as a suspension in aqueous environment containing essential nutrients. Recently, solid surfaces have been utilized to grow algae, giving an advantage of easier biomass harvest by scrapping, as compared to the highly energy intensive process of centrifugation for suspended microalgae. However, many challenges are still present before algae can be used as a economically-viable organism for the production of biofuels and added-value chemicals. The main challenges still present are: high water demand, efficient nutrient delivery, need for substrates capable of retaining large amounts of water, and high need for N-, P- supplementation.

Technology Summary

UGA scientists have developed a reactor that enables the fast growth of microalgae without the need for submersion in water. Microalgae can be grown on, for instance, paper and porous plastic mats. This low-maintenance system, which requires low energy input, continuously provide the microalgae films with necessary water, light and nutrients. The system was tested under different lighting conditions. Algae can be periodically harvested and processed into biofuels and/or commodity chemicals. Biomass productivity was very high, even before full optimization of the system (*in progress*), with values exceeding $8\text{g}/\text{m}^2/\text{day}$. The reactor is designed in such a way that algal mats can be stacked, and the productivity of the system could be designed to exceed $(8n)\text{g}/\text{m}^2/\text{day}$, where n = number of stacked mats. Small changes to the design allow for automated harvesting of the algae.

Advantages

- Low water demand. It is estimated that the reactor will need 70% to 75% less water per unit of mass of algae produced than all other traditional techniques. This also reduces the energy and time needed to dry algae before processing
- Efficient nutrient delivery. The reactor leads to little or no waste of nutrients, allowing for considerable reduction of production costs
- Ample choice of substrates for algal growth
- Allows for use of N- and P-rich wastewaters to promote algal growth, enabling the return of purified water to the environment
- Provides for continuous production of algae
- Compatible with genetically-engineered algae that grow under ordinary conditions
- Negative carbon footprint

Potential Applications

- High-volume algal growth and harvest, for the production of bio-oils, esters and commodity chemicals and biochemicals

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