2019 Algae Biomass Summit Abstract

Mary Rosenthal Student Travel Grant Application

Abstract: Energy harvesting system for turbulent flow: Application to microalgal cultures

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Although the microalgal productivity is higher than that of other crops, with up to 2,470-12,345 gal oil (hectare·yr)-1, there are some limitations that need to be addressed to make it competitive. One of the major bottlenecks in the use of biofuels and other bioproducts is the availability of light [1-3]. Outdoor cultures use available natural light. The depth and hence the productivity of the culture is limited by the light penetration and availability, that can reach only a few inches at most in a growing culture. For cultures maintained with artificial light, the energy for illumination can be a significant part of the cost of microalgal biomass production, reaching in some cases 50% or more of the costs. Besides the light quantity, the wavelength distribution also affects the microalgal biomass production. In previous work done in our laboratory and by other authors, it has been found that the wavelength affects not only the biomass productivity, but also its composition.

Current artificial lights are energy intensive, even in cases where LED systems are used, as all depend on conventional electric installations. Recent interaction with algae producing companies in national meetings have made clear that a light system with low operation cost and no limitations regarding electrical installations will fill a large market need. We will present advances on the development of a free floating, self-powered light system for microalgal cultures. The system integrates the illumination with LEDs that allow the selection of the most adequate wavelength for the culture, with an energy harvesting unit, powered by the turbulence of the culture. Current focus is on the miniaturization of the harvesting system, integration with additional power options and optimization of energy production.