Bioenergy from Algae: Cultivation and Harvest of Locally-Isolated Microalgae Strains for Biomass Production

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The economical production of microalgae biomass could lead to a new source of feedstock for renewable biofuels (biodiesel, ethanol, syngas) and other valuable bioproducts. Algae growth rates are influenced by climate, which is one of the major determining factors for site-specific cultivation using an open-pond system. Therefore, the first focus of the research was directed to isolate algae strains that can be readily grown within our local climate range. Microalgae samples were collected from areas across Missouri as well as other US locations, and cultured in the laboratory for the isolation purpose. To date, we have isolated over 200 strains of microalgae which have been identified based on the morphology; i.e, *Scenedesmus*, *Chlorella*, *Ulothrix*, *Monoraphidium*, etc. A local algae strain was chosen to be the main focus of our investigation for the optimal growing and harvesting conditions that will yield the maximum amount of microalgae biomass. The different growing conditions evaluated were the locations (inside and outside of greenhouse), and the amount and frequency of the nutrient media and carbon dioxide supplied to the algae culture. The growth of microscopic algae in the culture tank was indirectly monitored by measuring the optical density with a spectrophotometer. Different types of nutrient media that had been developed in the laboratory were also evaluated for their effect on the rate of algae growth. Harvesting test was conducted by continuously removing 10, 50 or 90% batch of the culture volume when algae reach the maximum growth, and monitoring the growth rate of the remaining algae culture. The long-term cultivation and harvesting of the particular algal strain yielded the most biomass when the 90% batch harvesting strategy was employed. We have isolated and identified multiple microalgae strains that show good potential for economical biomass production based on their capacity to grow rapidly under local climate conditions and resist the invasion by undesirable species.