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U.S. Department of Transportation

SunGrant INITIATIVE South Central Region

Title: *Effect of Growth Media Chemical Composition on Algal Biomass Properties*

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Project Goals

The main objective of this project was to optimize a closed photo-bioreactor system that will maximize oil accumulation in microalgae cells growing in swine lagoon waste water and vinasse from sweet sorghum to ethanol production process while maintaining a high rate of biomass production, carbon dioxide capture and waste water remediation. Specific objectives include to: 1) Select high performance microalgae strains that are suitable for waste water remediation and high oil accumulation, 2) Design, construct and optimize operating conditions for a 25 L microalgae photo-bioreactor system to maximize oil and biomass production yield, 3) Test and improve the non-destructive real-time process monitoring and control system that has been developed at OSU and develop a mathematical model for calibration of sensors to be used to monitor biomass production in 25 L reactor, 4) Study chemical and physical properties of biomass and oil produced by different microalgae strains grown on swine lagoon waste water and vinasse. Examine the efficiency of nutrient removal and carbon dioxide capture during microalgae growth, and 5) Train graduate and undergraduate students and extension personnel on microalgae production.

Project Outcomes

- Six commercial microalgae strains [*Botryococcus braunii*, *Nannochloropsis oculata* and *Dunaliella tertiolecta*, and three strains native to Oklahoma- *Picochlorum Oklahomensis* (PO), *Dunaliella* species SP19 and SP20] were used for the screening studies.
- One of the Oklahoma native algae strains, PO has the highest biomass productivity, grows very well in swine waste water & accumulates significant amount of oil, about 30% of dry biomass.
- PO has a good potential for producing algal biomass that can be used in production of various bioproducts including biofuels while removing nitrogen and potassium from animal waste water.
- Higher biomass concentration in the media (g/L) and lower ash content in the algal biomass were achieved using animal waste water as compared to regular media.
- A non-destructive real-time process monitoring and control system was developed and tested successfully.

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All Senior Personnel are located at Oklahoma State University - *Biosystems & Agricultural Engineering*

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