BioFuels As An Alternative Fuel Source For Aviation

by

Dr. Bilal Mark McDowell Bomani (REB)

Team Members:

Dr. Dan Bulzan – Associate Principle Investigator (RTB)
Robert C. Hendricks (ST–R)
Dr. Bilal Mark McDowell Bomani (REB)
Diana Centeno-Gomez (DEF)
Dr. Arnon Chait (REU)

The sustainability of aviation directly depends on the availability of fuel. With the growing gap between production and demand, increasing prices, and concentration of known reserves in politically unstable regions, biofuels are considered a viable alternative to securing the future of aviation. Biofuels are a renewable energy source, which could be customized to different fuel needs, including jet fuel. NASA GRC has initiated a pilot program to develop in-house capabilities to study two principal sources of biofuels: sea water algae, and arid land halophytes. The present program is focused at putting together the initial infrastructure for the study, to developing a long-term program to study and optimize properties and growth parameters, and to develop collaborations with aviation companies, commercial ventures and government agencies to forward the application of biofuels to aviation needs.

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The Big –3 for GRC

(1) We do not use freshwater because it competes with human consumption.

(2) We do not compete against traditional food crops such as corn, soybeans, sugarcane, etc…

(3) We do not use arable land because it competes with food crops.

GRC BioMass Fuels

Research Program

GRC will apply our unique expertise to key production processes for algae and halophytes as well as develop internal R&D capabilities not presently supported by core disciplines.

The primary goals is to (1) develop in-house expertise and facilities for biofuels, (2) contribute original R&D for optimizing biomass production, and (3) facilitate collaborations leading to increased biofuel utilization in aviation and mobility fuels.

Computational simulation, validation and process optimization of small scale reactor systems will be developed to enable improvements and scale up of biomass facilities including those applicable to space exploration.

Indoor Biofuels Research Lab

Experimental chambers with various salinity levels

***Chaetomorpha* sp. Macro-Algae**

Soil/Sand planting

Indoor Biofuels Research Lab

(Halophytes)

***Salicornia* virginica - Pickleweed**

***Salicornia* bigelovii – drawf saltwort**

***Rhizophora mangle* – Red mangrove**

***Kosteletzkya virginica* – Seashore mallow**

Processing and Analysis of BioMass

➔Biodiesel GC

➔ Soxtec Oil Extractor System

➔ Hydrogenator/Gas Reactor

➔ Hydrogen Generator

➔ Oil/Lab Press

➔ Ultrasonic mixers for Transesterification

GreenLab Research Facility

GreenLab currently under Construction (July completion)

Mangrove nursery

Goal is to expand small indoor plant success to large outdoor facility with 14 large growth chambers

*Mangrove nursery

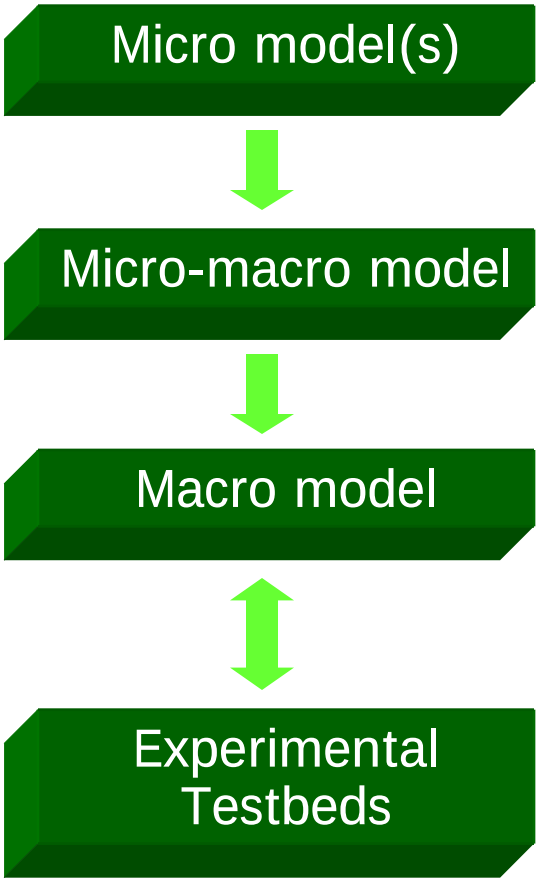
*Chaetomorpha algae

*Salicornia (virginica & bigelovii)

*micro-algae systems

GRC Micro-Algae Program

(open pond system optimization)



Basic biology:

- Metabolism, energy conversion, growth, exchange w/environment

Coupling to large-scale transport:

- Distribution function approach

Large scale transport processes:

- Overall geometry, flow, nutrients
- Process optimization

External Collaborations

Seashore Mallow Field planted next to Corn Field

Optimizing open pond design along with utilizing Co2 gases from industrial factories

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