U.S. DEPARTMENT OF ENERGY
AlgaePrize
NextGen Algal Innovators

Team Name:

Polyculture Jam

Team Schools/Organizations:

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Abstract:

Current algaculture production facilities typically employ the use of a single microalgal species for the production of biomass and bioproducts. However, maintaining unialgal cultures, much less axenic cultures, becomes nearly impossible over time and it is inevitable other microorganisms will begin to populate open cultivation systems. Furthermore, microalgae produce various waste products that can start to build up in cultures and inhibit growth and there are often vast differences in growth performance in different seasons that result in varying biomass yields. To overcome limitations of seasonal unialgal cultures, we propose, the more microalgae, the merrier! The aim of Polyculture Jam is to generate synergistic combinations of microalgae that outcompete unialgal cultures by increasing the diversity of microalgae in the system. The rationale of this project is supported by observations that naturally-occurring polycultures have been found to produce more biomass and are more resistant to grazing and stress conditions than synthetic combinations of algal species. Our approach will emulate natural systems and algal blooms by developing a highly-productive, efficient, and reproducible microalgal polyculture: a mixture of multi-season microalgal strains that performs better than a single strain over the duration of multiple seasons representative of the southwestern United States. Batch cultures will be grown at various temperatures to measure growth characteristics for individual strains, including both photoautotrophic and mixotrophic microalgae. Next, tailored combinations of high-productivity strains will be evaluated for semi-continuous cultures in simulated winter, spring, summer, and fall conditions. Culture density for unialgal and poly-cultures will be measured by spectrophotometry and biomass metrics (e.g., dry weight and ash-free dry weight). Polycultures will be evaluated using microscopy and hemocytometry to estimate the

community composition for the various seasonal conditions as well as culture health, e.g., bacterial load and other contaminants. The successful outcome of this project will be a robust microalgal polyculture that generates abundant biomass throughout the year for the production of food, feed, and fuel. A synergistic microalgal mixture which is more resistant to contamination, resilient in various types of weather, and stays healthy through the long haul? It's a Polyculture Jam!

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