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Microalgae Cultivation and Photosynthesis

ESTABLISHMENT OF A LONG TERM COLLECTION OF PHOTOSYNTHETIC MICRORGANISMS FOR AGROENERGY RESEARCH IN EMBRAPA

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Keywords: Microalgae;Genetic resources;Criopreservation

Abstract

Microalgae are recognized as one of the most productive organisms in terms of biomass. In addition, for some species, as much as 70% of their mass is composed of lipids, which can be used to produce biodiesel. They can be grown in non-arable land using seawater, brackish water or even wastewater, and can capture carbon emissions from industrial plants. These characteristics render microalgae biomass a promising alternative source for biofuels with minimal problems with direct and indirect land use. Brazil has great potential for its large scale production given that the country possesses a large tropical coastal area, with 10.959 km, has approximately 12% of the world's freshwater supply and receives average insolation levels of 8 - 22 MJ/m2.day. Nonetheless, there are significant technological challenges to produce economically competitive algal-derived biofuel. Aiming to reduce production costs, research efforts on the isolation, characterization and domestication of highly productive algal strains from Brazil's biodiversity are crucial. In order to establish a long term microalgae for biofuels breeding program, the Brazilian enterprise for agriculture research (EMBRAPA) initiated actions in september of 2013 aiming to create a reference collection of photosynthetic microrganisms genetic resources. This collection is based in Embrapa Agroenergia (Brasilia – DF) and currently abrigates 40 unialgal cultures derived from Brazilian megadiverse biomes, such as Pantanal, Amazon forest and Cerrado (Savannah). Briefly, environmental samples were collected and firstly cultivated in flasks containing Bold-Basal medium (BBM) supplemented with ampicillin and chloramphenicol (for eukaryotic algae enrichment) and Blue-Green 11 medium (BG11) supplemented with cicloheximide (for cyanobacteria enrichment). Subsequently, strains were isolated through serial dilution in liquid media or by growth in isolated colonies in solid media agar plates. The isolated unialgal strains were taxonomically identified based on morphological methods. Identification was confirmed using molecular methods based on the 16S rDNA region sequences for cyanobacteria and rbcl and ITS-2 DNA regions sequences for eukaryotic algae. Criopreservation based on ultrafreezing in the presence of low concentrations of dimetilsufoxide (DMSO) and/or methanol have been successfully applied to 58% of the collection so far. Additional efforts focused on the collection of novel strains are currently under way.