Increasing the Lipid Density of Chlorella Algae with Aquatic Plants

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The purpose of this experiment is to determine if growing Chlorella kessleri algae in water treated by Panicum hemitomon (maidencane) increases the amount of lipids, which can be extracted from algae to create biofuels. When algae is exposed to a nutrient-deprived environment, the cells “panic” and induce the malic enzyme in order to maintain cellular stability. In turn, the malic enzyme catalyzes the creation of triglycerides (lipids). When water is filtered through maidencane, algal nutrients—nitrate, ammonia, and phosphate—are removed. Unfortunately, current procedures of inducing the malic enzyme are not economically viable and cannot be used in an industrial setting. Because aquatic plants remove algal nutrients from water, they provide an affordable and novel method for creating a nutrient-deprived medium for algal growth. First, wastewater with established nitrate, ammonia, and phosphate content was filtered through maidencane, an aquatic plant, and the contents of these nutrients were evaluated throughout the filtration process. Maidencane filtered out 90% of all nutrients after 7.5 hours. Samples of algae were then grown with 100%, 75%, 50%, 25%, and 0% of the water’s original nutrient contents, with growth being evaluated throughout the process. Lipid content and malic enzyme activity were evaluated before and after growth. The algae grown in the fully treated water had 3.0 times more lipids per cell, 1.8 times more total lipids, and 3.1 times the malic enzyme activity of the algae grown in the untreated water, which supports the hypothesis.