Optimization of Starch Content in Lemna minor Through Modified Environmental Conditions

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Through decades of endless carbon emissions and multiple energy crises, current renewable energy sources remain environmentally harmful, inconsistent, and energetically inefficient. A particular renewable source, biofuels, a liquid fuel made from organic feedstocks and is most similar to current liquid fuels, continues to fall short because of increased land competition, price, and inconsistency of the materials. To address these shortcomings, Lemna minor, or duckweed was selected as the ideal feedstock as the aquatic and invasive plant inherits characteristics of rapid biomass growth and high starch content. Additional treatments aimed to increase starch dry-weight content using low-energy and low-costs, these included additional plant hormones, such as auxin and cytokinin, and stress-inducing factors, such as sodium chloride and nutrient deprivation, which were all conducted in a simulated aquatic environment. The concentration values acquired through experimentation of the applied treatments displayed a variety of positive growth in starch concentration in comparison to the control duckweed group: 51.3% for hormone-treated, 29.7% for sodium chloride-treated, and 17.5% for nutritional deprivation. Additional qualitative observations determined the hormone-treated duckweed yielded the greatest biomass, with sodium chloride-treated, control, and nutrient deprived placing respectively. In comparison to the common vegetative feedstock, corn, which yields a range between 50-70% starch content, the hormone-treated duckweed yielded a lower starch concentration of 51%. But when accounting for duckweed's consistent and rapid growth, additional wastewater treatment, and role as a carbon sequestration, duckweed acts as a great alternate feedstock for the production of biofuels.

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