The Effects of Phosphorus Depletion on Lipid Yields for Chlorella sp.

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As the world begins to reflect upon the severe effects of global climate change, many governments have been exploring alternative energy sources. Unlike many renewable energy sources, biofuels are capable of being stored and transported. Biofuels from crops such as sugar cane, corn, and palm oil are unsustainable except with the help of government subsidization; they create a carbon deficit and compete for arable land [1]. Algae can produce the necessary amount of biodiesel to release America’s dependence from fossil fuels with just three percent of the arable land in the United States compared to agricultural crops requiring 61 percent [2]. However, the cost to produce algae biofuels is not economically viable. In order to increase the lipid yield of the algae, many production facilities "starve" the algae of basic nutrients, especially nitrogen. This causes the algae to go into a "stress mode" and produce lipids rather than reproduce themselves. However, the post extraction algae residue (PEAR) is a by-product used for many purposes. The PEAR can be sold because it has a high nitrogen content, and depleting phosphorus can increase lipid yields but still maintain the PEAR's market value. After running four treatments of different phosphorus levels, depleting phosphorus to one-fourth the controlled amount resulted in a significant increase in lipid production. The P-value from the analysis of variance for both the polar and non-polar lipids was less than 0.05. This method can lower the cost of producing algae biofuels, taking it one step further to becoming economically viable.

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