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Electric Pulse Parameter Exploration for Lipid Extraction from Microalgae

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A desire to limit CO2 emissions and overall energy demands has motivated the search for alternative energy sources. The first approach involved the development of plant biofuels for a greener, renewable solution; however, crop-based biofuels grew unpopular because they were expensive and used foodstuffs. Using microalgae can avoid these issues and are now an increasingly popular source of liquid fuels. One area in microalgae biofuel production that requires improvement is the extraction process for lipids or other biofuels. The most common lipid extraction method, Bligh & Dyer [1], is costly and toxic. Treating microalgae with electric pulses (EPs) induces electroporation, which can lyse the cells to increase the extraction efficiency of safer, greener biofuels [2]. Thus, EPs can intensify biological effects to provide a safer and less expensive renewable solution than the Bligh & Dyer method. This study explores the optimization of EP parameters and green solvents to improve lipid extraction efficiency. While preliminary research has shown EPs are an effective pretreatment, the extent of their effectiveness remains unknown. We report a comprehensive analysis of EP parameters for treating microalgae, both cyanobacteria and green algae, with nanosecond and conventional electroporation parameters.

[1] E. G. Bligh and W. J. Dyer, "A rapid method of total lipid extraction and purification,"*Can. J. Biochem. Phys.*, vol. 37, no. 8, pp. 911-917, 1959.

[2] C. Joannes, C. S. Sipaut, J. Dayou, S. M. Yasir, and R. F. Mansa, "The Potential of Using Pulsed Electric Field (PEF) Technology as the Cell Disruption Method to Extract Lipid from Microalgae for Biodiesel Production," *Int. J. Renew. Energy Res.*, vol. 5, pp. 598-621, 2015.

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