Green Watts: Investigating Power Production of a Single Chamber Plant Microbial Fuel Cell in a Modular System Comparing Crop Plants, Triticum aestivum, Saccharum officinarum and Zea mays - A Novel Fifth Year Study

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Impacts of global warming are causing a need for renewable energy alternatives. Plant-microbial fuel cells (P-MFC's) have emerged in recent years as a promising method that uses bacteria to oxidize organic matter and convert chemical energy into a harvestable electrical current. The goal of this study was to explore the potential of crop plants in P-MFC's comparing photosynthetic C4 plants, Saccharum officinarum (sugar cane), and Zea mays (maize), to C3 plants, Triticum aestivum (wheat). Experiments were conducted with sixteen single-chamber fuel cells, four each of S. officinarum, Z. mays, and T. aestivum; each crop plant was connected in a series of three and compared to its single control counterpart. Additionally, a negative control was set up in the same way. Systems were monitored daily for seventeen days using a multi-meter. Data were analyzed for current, voltage and power density for all cells. It was observed that on average the modular P-MFC's performed 10.9 times greater than their single cell counterparts, with the C4 plants producing 2.58 times more power than the C3 plants. The highest modular P-MFC was the C4 plant, Z. mays, which at its peak produced a total of 1.5 watts. Both C4 plants, S. officinarum, and Z. mays modules were able to light LED's. The C4 plants outperformed the C3 plants in power output in modular and individual systems, indicating a possible correlation between the photosynthetic contribution and energy production. Such comparisons could provide an important application if C4 crops could be used as both a food and power resource.

Awards Won:
Second Award of $1,500