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Plant Microbial Fuel Cells: A Potential Solution to the Green Energy Problem in Bangladesh

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Extended Abstract

Plant Microbial Fuel Cells (PMFCs) are a novel technology in which living plants can generate green electricity with the help of soil microbes. It can act as an ecological solar cell and hence it is a renewable energy source with zero carbon emissions. In short, the mechanism of the PMFCs is that, due to photosynthesis, the green leaves produce carbohydrates (sugar), and almost 70% of it is released in the root zones. The bacteria that live near the root zone break it and hence generate electrons. The electrodes and external circuit enable the electrons to flow and generates the bioelectricity. In our research, almost all different types of trees/plants show the potential for bioelectricity generation. The main benefits of these PMFCs are to get green energy and food from the plants simultaneously. So, we do not need to destroy food products such as corn or soybeans to get green energy.

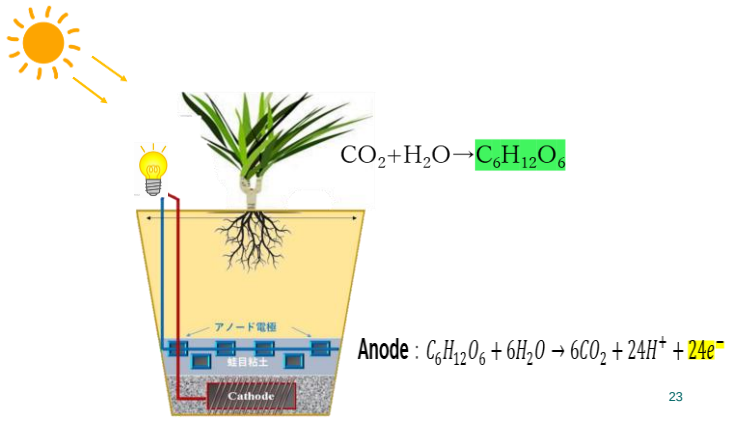

Figure 1: Mechanism of Plant Microbial Fuel Cells (PMFCs).

It has been observed that the PMFCs can generate electricity from rice fields, corn fields, and other vegetable plants without hampering the harvesting of the crops or vegetables. Fig. 1 shows the mechanism of PMFCs which have been used for the various types of plants in this research. Fig. 2 shows the polarization curve of a typical PMFC. It has been seen that the power density of a PMFC is around 350mW/m^2.

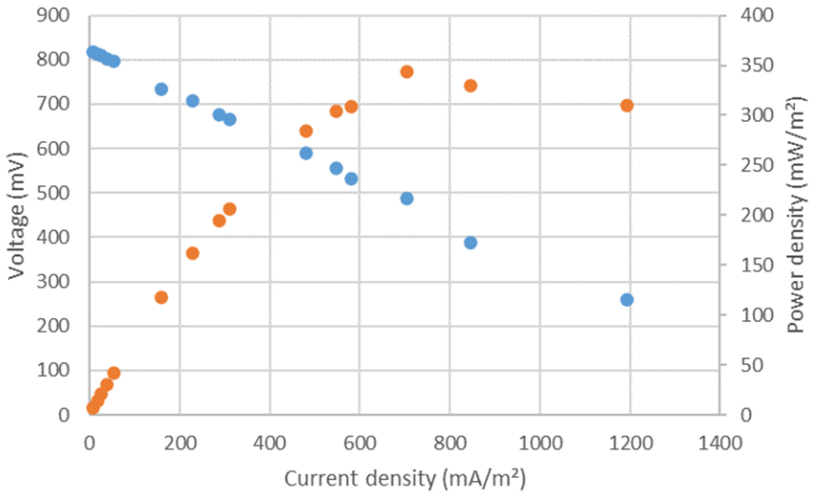

Figure 2: Relation among voltage, current, and power density in a PMFC.

The voltage generation of PMFC can be increased with a series connection and according to the needs. Though the power density of PMFCs is not so high, it can be increased with further research by modifying the design and increasing the amount of effective microbes. Plant microbial fuel cell is a promising technology to generate green energy and to solve the problems of energy shortage in the future. It can also supply power to the sensors of the smart monitoring systems for the smart cities and AIEVs. As an environmentally friendly technology, PMFC can give the “Light of hope” to the people of the world who are still living in the dark at night.

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