**Enhancing the Potential of Plant Microbial Fuel Cells: The Influence of Botanical Characteristics on Bioelectrical Performance**

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Plant Microbial Fuel Cells (PMFCs) represent an innovative application of microbial fuel cell technology, utilizing plant rhizodeposition to fuel electrochemically active bacteria on the anode surface, thereby generating bioelectricity. This review delves into various botanical aspects of plant species employed in PMFCs, aiming to investigate whether their electrical performance varies based on distinct life forms and root systems.

For each plant species, we conducted a thorough investigation encompassing three key aspects: I) Nomenclature; II) Raunkiær life form; III) Root architecture. To compile pertinent information, we conducted an exhaustive search for original articles detailing PMFC experiments, utilizing the Clarivate search tool. Every plant name and Raunkiær life form underwent rigorous verification against the POWO database [1] and cross-reference with the flora native to the species' origin. Root architecture was categorized into three main groups: 1) Taproot; 2) Adventitious; 3) Fibrous, with confirmation from the TRY Plant Trait Database [2].

Regarding the collection of electrical performance data, we excluded species under specific conditions: a) When only voltage or current values were provided; b) When average power and peak power values were exceedingly similar; c) When power density values fell below 1 μW/m2 or exceeded 950 mW/m2. Ultimately, our study involved 46 plant species and 42 documents.

Our analysis unveiled noteworthy disparities, with the Epiphyte/Chamaephyte/Nanophanerophyte group differing significantly from Geophytes, and Therophytes and Hemicryptophytes exhibiting the highest median values. Additionally, we observed significant differences among the root architecture groups, with Taproot group registering the highest median value. These findings underscore the influence of plant life forms and root systems on electrical performance in PMFCs. Nevertheless, we acknowledge that our results may be subject to limitations due to the absence of a standardized benchmark for electrical measurements, necessitating approximations of power density values.

[1] POWO (2023). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; http://www.plantsoftheworldonline.org/ Retrieved 25 January 2023.

[2] Kattge, J, Boenisch, G, Diaz, S, et al. TRY plant trait database - enhanced coverage and open access. Glob Change Biol. 2020; 26: 119-188. https://doi.org/10.1111/gcb.14904