# Effect of soil types on nitrogen cycling and electricity production from microbial fuel cells with dried leaves

**Sri Shalini Sathyanarayanan, Yvan Gariepy** and **Vijaya Raghavan**
McGill University, Canada

**Statement of the Problem:** The global energy prospective is quiet fluctuating. The energy markets are moving towards technological growth and environmental concern. In this aspect, Microbial fuel cells (MFCs) for conversion of organic matter into electricity for recovering green energy are becoming significant. Soil has been used to generate electricity in MFCs and shown several potential applications in today's world. Whereas, usage of dried leaves having a high source of organic content with soil types in an MFC is not studied before and it is novel. The main aim of this study is to address the effect of soil types on the electricity production, nitrogen cycling and greenhouse gas emissions from MFCs loaded with dried leaves.

**Methodology:** Experiments were carried out in single chambered MFCs equipped with air cathode and carbon felt anode operated for 109 days at room temperature. Two different soil types such as sand and clay were used. Dried leaves were collected from Morgan Arboretum forest reserve, McGill University, Canada. Voltage readings with 500 to 1150 Ω external resistances were measured continuously for study period. MFCs were monitored regularly for gas emissions and changes in nitrogen compounds.

**Findings:** Sandy soil used in the study had 100% sand and clay soil had 40% clay, 38.5% silt and 21.50% sand. Dried leaves had 72% of organic matter with 42% of carbon content. Both MFCs with sand and clay soil with dried leaves gave continuous electricity production throughout the study period with maximum power density of 29.2 $mW/m^3$ (1.9 $mW/m^2$) and 23.8 $mW/m^3$ (1.6 $mW/m^2$), respectively. Clay soil MFC had higher methane emissions (27%) than sandy soil. Nitrogen profiles showed nitrogen uptake by soils and its possible nitrogen pathways.

**Conclusion & Significance:** The study demonstrated that the soil types with dried leaves have significant impact on electricity generation and nutrient cycling in MFCs. It has potential for production of renewable energy and climate change mitigation.

## Biography

Sri Shalini Sathyanarayanan has her expertise and interests in the field of Environmental Science with a keen focus on nitrogen management, solid waste and waste water treatment, environmental biotechnology and microbial fuel cells. She has received her Doctoral and Master's degree in Environmental Science and Bachelor's degree in Biochemistry. She is a recipient of many scholarships and fellowships for her research work in India and abroad. She has experience in working on interdisciplinary projects funded by national and international organizations. She has hands on experience in teaching practical and part-time theory classes. Her Post-doctoral experience in real-scale field studies also taught her to handle several challenging issues in environmental field. Her in-depth work on biological treatment and nitrogen management studies creates new ways for protecting environment sustainably. The current project on microbial fuel cells with soil and waste materials is very important in tackling many issues in energy demand, waste management and greenhouse gas emissions.

srishalini10@gmail.com

**Notes:**