

# The Plant Microbial Fuel Cell: producing green energy with living plants

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## Six work packages

- WP1. Development of high tech Plant MFCs for application in e.g. greenhouses
- WP2. development of sediment Plant-MFCs in natural environments
- WP3. Exploration of plant functioning and vigour in Plant-MFCs for preservation of healthy plants
- WP4. Exploration and maximization of rhizodeposition by plants in Plant-MFCs
- WP5. Exploration and optimising of rhizosphere and anode microbiology in plant-MFCs
- WP6. Modeling of Plant-MFC & Early technical, financial and sustainability assessment of Plant-MFC scenarios

## WP4 objectives:

Main objectives:

Exploration and maximization of rhizodeposition with a 70% rhizodeposition of total fixed carbon

Sub-objectives in consecutive order:

- Develop consistent screening protocol
- Insight in genetic variation in exudation
- Find optimal balance between crop growth & exudation
- Optimize root system architecture for optimal exudate production
- Synthesis to optimal rhizodeposition

## Preliminary results

- Fast microbial breakdown of exudates (2 hours) *in vitro* and *ex vitro* obstructs reliable quantification
- Binding of exudates to solid substrate like sand hampers reliable quantification
- AgNO<sub>3</sub> and organic antibiotics seem to slow down microbial breakdown of exudates

## Optimal experimental system

- Exclusion of the effect of the biofilm around the roots on the quantity of exudates measured
- No use of antibiotics (might influence root physiology)
- Possibility for high throughput screening
- Possibility to get rid of nutrients in the samples to simplify exudate quantification by High Performance Liquid Chromatography (HPLC)

## Potential problems

- Absence of bacteria does not give a representative image of root exudation
- System is not suitable to screen a wide range of plant species for exudation

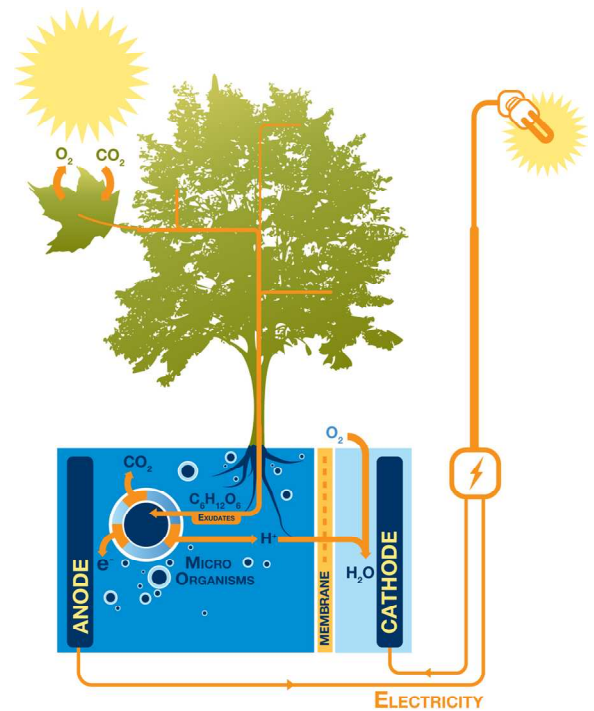


Figure 1: Schematic overview of the Plant Microbial Fuel Cell (Plant-MFC)

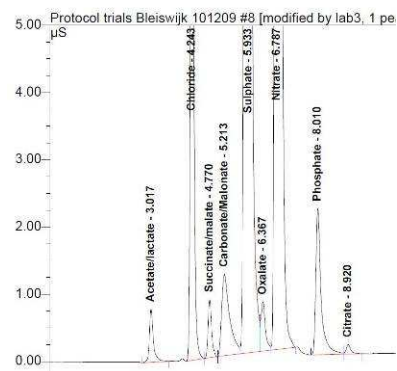


Figure 2: Example of a High Performance Liquid Chromatography (HPLC) chromatogram. Sample taken from tomato rhizosphere extraction.

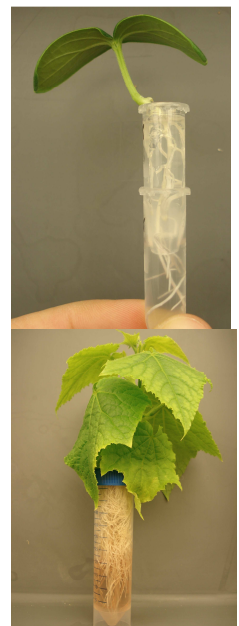


Figure 3: A) experimental set up for plantlets B) experimental set up for adult plants

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