Optimising a Plant (Red Flame Ivy) Microbial Fuel Cell as a Sustainable Electrical Source

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BACKGROUND

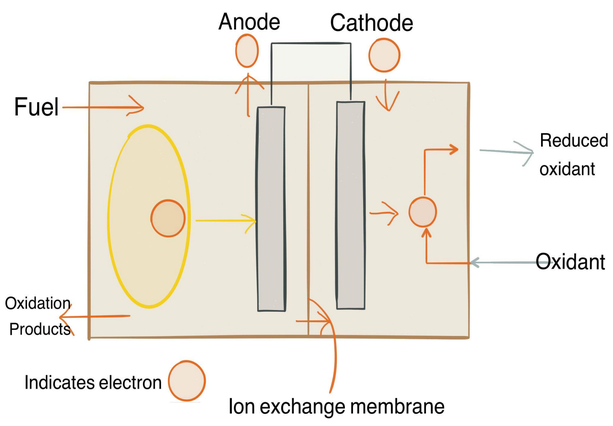


Figure 1.1 Schematics of a MFC

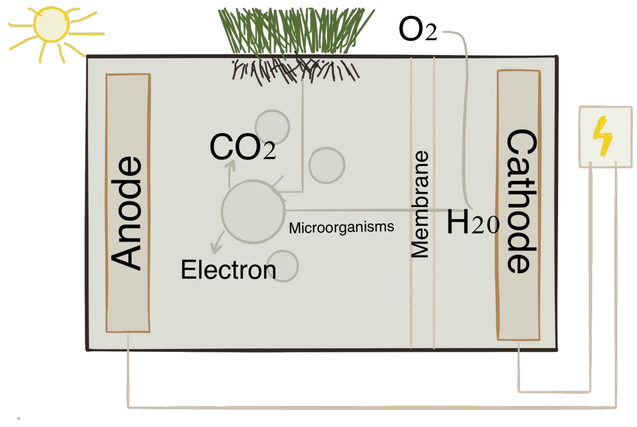


Figure 1.2 Schematics of a PMFC

Costly	Components are hard to come by
Low power density	Only able to power appliances that have low power needs
Inefficient	High internal resistance

OBJECTIVE

Create a sustainable PMFC

→ Able to maintain a stable voltage for 24 hours

PROJECT OVERVIEW & METHODOLOGY

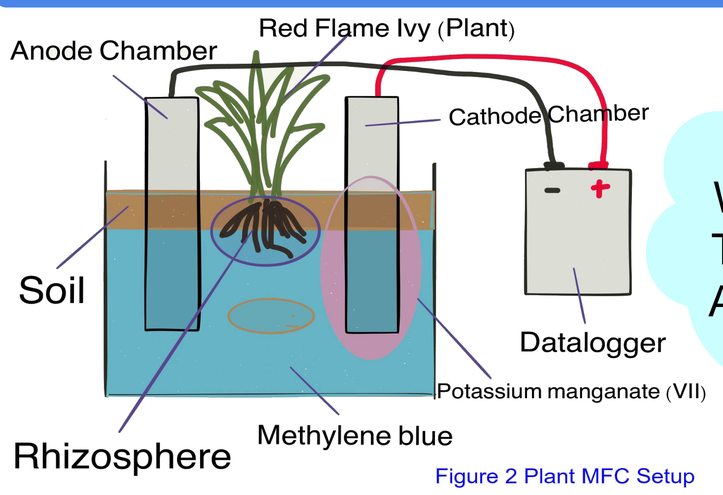


Figure 2 Plant MFC Setup

WORMTEA IS WORM DROPPINGS THAT CAN BE USED AS FERTILISER FOR PLANTS!

EXPERIMENTS CARRIED OUT

A	PMFC VS MFC	Compare difference in voltage output between the MFC and PMFC
B	WORMTEA VS NO WORMTEA (PMFC)	Find out about the effects of wormtea on voltage output
C	REPLACING CHEMICALS WITH NATURAL RESOURCES	Find the best natural reducing and oxidising agents

RESULTS & DISCUSSION

Peak voltage of 0.394V produced due to the redox reactions within PMFC

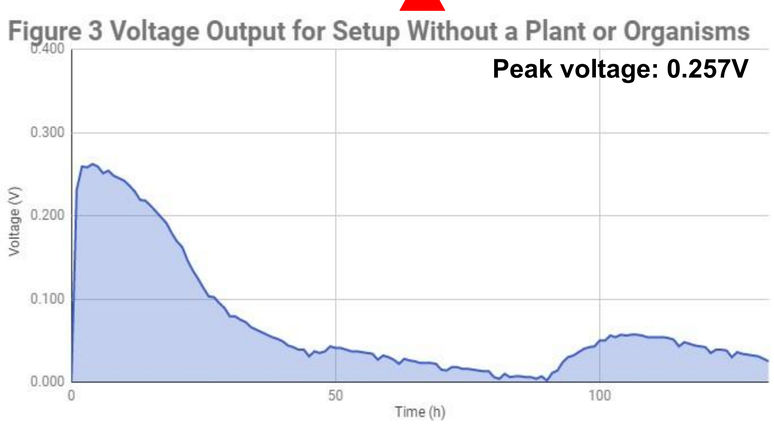


Figure 3 Voltage Output for Setup Without a Plant or Organisms

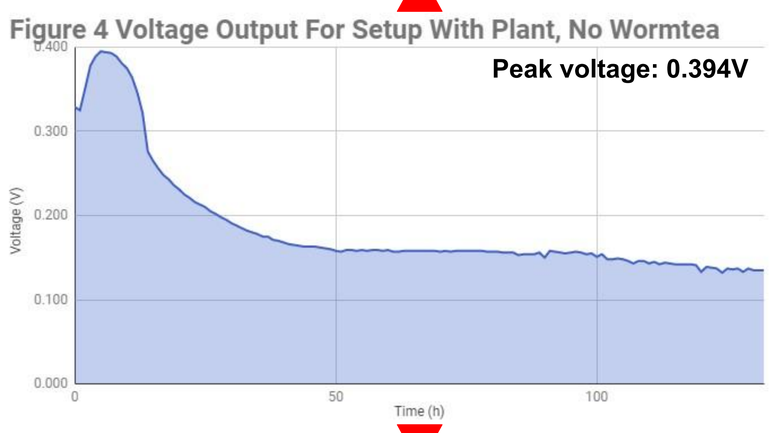


Figure 4 Voltage Output For Setup With Plant, No Wormtea

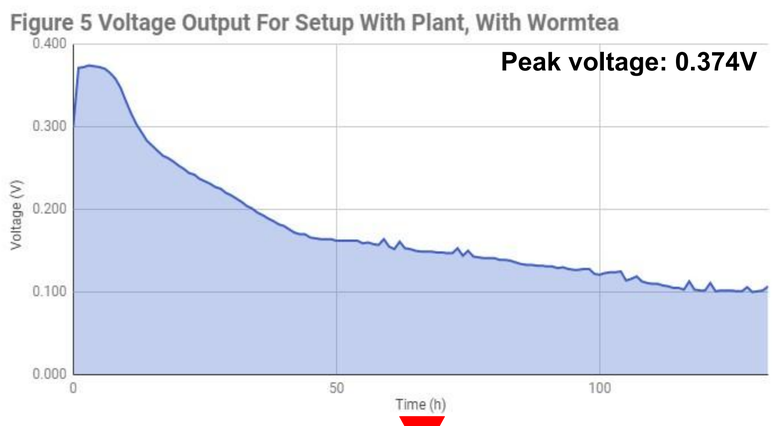


Figure 5 Voltage Output For Setup With Plant, With Wormtea

Wormtea allows for a gentler drop after peak voltage has been reached

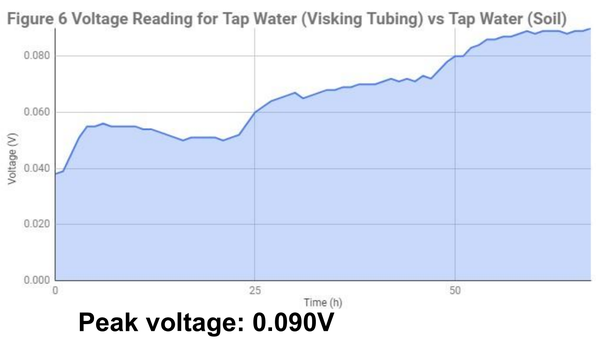


Figure 6 Voltage Reading for Tap Water (Visking Tubing) vs Tap Water (Soil)

Peak voltage: 0.090V

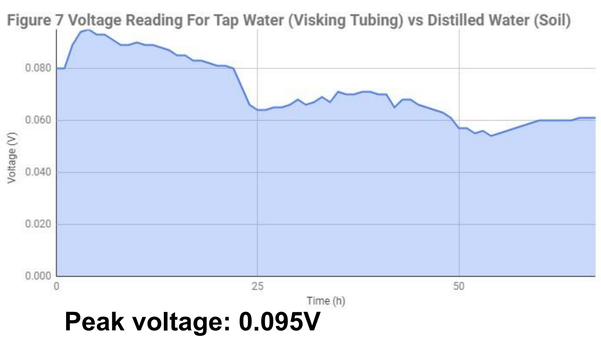


Figure 7 Voltage Reading For Tap Water (Visking Tubing) vs Distilled Water (Soil)

Peak voltage: 0.095V

Figure 8 Voltage Reading for Tap Water (Visking Tubing) vs Salt Water (Soil)

Peak voltage: 0.096V
Average Voltage Reading of the setup without a plant: 0.016V

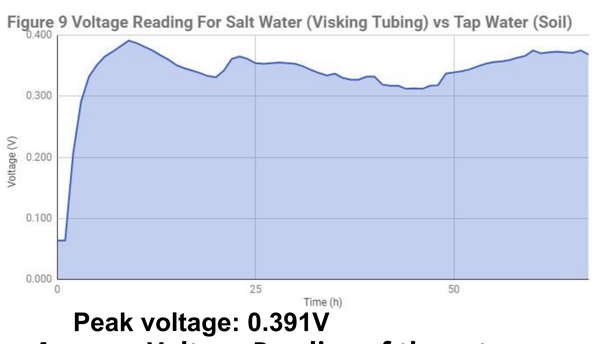
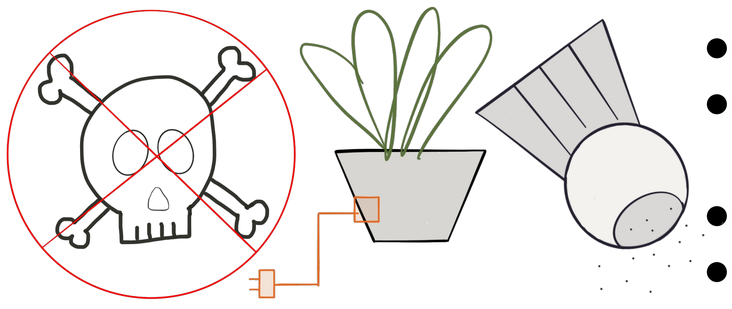


Figure 9 Voltage Reading For Salt Water (Visking Tubing) vs Tap Water (Soil)

Peak voltage: 0.391V
Average Voltage Reading of the setup without a plant: 0.100V

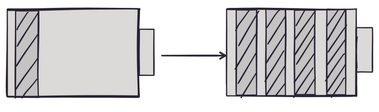
Salt vs tap water experiment yields the highest voltage of 0.391V

CONCLUSION

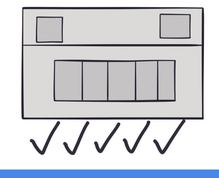


- Natural oxidising and reducing agents can replace toxic chemicals
- Natural reagents lower the voltage output but makes the set-up more sustainable & accessible
- Plants may be an better alternative to generating greener electricity for usage
- Salt-Tap water set-up yielded the best results (peak voltage of approximately 0.4V)

FUTURE WORK



Increase power & efficiency by decreasing resistance



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