

Study of plants culture on substrate of Urine origin: Roots zone focus.

Key words: Plant cultivation, urine treatment, nitrogen recovery, halophilic conditions, food production, MELiSSA crops.

Abstract: The MELiSSA loop as a regenerative life support system has to maximize the recovery of the main elements from the mission wastes. Urine is one of these wastes, and the possibilities to grow plant as closed as possible of the source of available urine substrate may present several advantages to the MELiSSA loop.

Although the high salinity was a strong inhibitor, the demonstration of urine nitrification (i.e. transformation of Nitrogen part from urine to nitrate), in axenic conditions, has been performed.

This nitrification still need to be better characterised, however it opens the possibility to grow plants on a substrate of urine origin. Nowadays, several challenges remain, mainly: selection of the microbial consortium, plant kinetic, salinity inhibition, roots development, nutrient uptakes, and edible biomass quality.

Starting from the state of the art, the proposed PhD project would focus on the selection of the microbial consortium, kinetic evaluation and impact on the edible biomass production. From this task, the project will comprise experimental work on microbial consortium and demonstration at bench scale. This work would be done at laboratory scale.

Impact on MELiSSA: Definition of technologies and strategies for urine treatment in the MELiSSA loop

MELiSSA partners: U Gent (B), UAB (E), U Napoli (I), UClermont Auvergne (B), U Guelph (CDN)

References:

Lasseur, C., Brunet, J., de Wever, H., Dixon, M., Dussap, G., Godia, F., Leys, N., Mergeay, M., Van Der Straeten, D. (2010)

“MELiSSA: the European Project of closed life support system”

Gravitational and Space Biology, 23: 3-12

Feng D, Wu Z, Xu S.

Nitrification of human urine for its stabilization and nutrient recycling.

Bioresour Technol. 2008 Sep;99(14):6299-304.

Desired knowledge: Candidates preferably possess a degree in microbiology, plant physiology, chemistry, biotechnology or bioengineering. They have to be familiar with metabolic pathways analysis and plant culture.