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EGU23-15256
https://doi.org/10.5194/egusphere-egu23-15256
EGU General Assembly 2023

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Water scarcity and sanitation are two challenges deeply related to urbanization and climate change. Thus, the future development of urban areas requires innovative design solutions to increase cities' resilience (SDG11), looking for new resources. One answer is the use of nature-based solutions (NBS) for wastewater treatment, to provide multiple benefits while transforming a waste into a new resource. Green walls for greywater (GW) treatment are the NBS that converts the unused vertical facades into important ecosystem services, treating the amount of domestic wastewater that excludes the toilet flush. To better understand the removal processes and improve green walls design, pilot studies have been performed in recent years, usually in controlled conditions. However, it is important to evaluate also the influence of more real operating conditions that can stress the biological component or damage the whole system, affecting the effectiveness of the GW treatment.

This study aims to test stressing conditions due to chemical loads caused by variations in GW composition. Fifteen identical vegetated pots have been filled with a mix of coconut fibre and perlite (1:1 in volume) and one *Hedera helix* per pot. Every pot received 24 L day^{-1} of standard GW (Diaper et al., 2008), provided in 15-minute batches every hour (HLR=740 L m^{-2} day^{-1}). The pots were organised in 5 configurations (3 pots each as replicates) and four of them received periodic spikes of modified GW: (i) – always standard GW as control (ii) bleach, (iii) floor cleaner, (iv) drain opener, (v) sodium hydroxide added to the standard recipe at increasing concentrations. The concentration was selected simulating the common use of these cleaning products in buildings, provided with wastewater collecting tanks of different sizes, resulting in (a) 500 ppm for (ii-iv) and 100 ppm for (v); (b) 1000 ppm for (ii-iv) and 200 ppm for (v); (c) 2500 ppm for (ii-iv) and 500 ppm for (v). The input and output water were weekly sampled from May 2022 and different parameters (pH, Temperature, Electric Conductivity, Dissolved Oxygen, Biochemical Oxygen Demand - BOD_5, Chemical Oxygen Demand - COD, Sulphate, anionic surfactants - MBAS) have been measured to evaluate the effects on biological systems (plants and biofilm) through their removal performance.

Results showed that all configurations were not damaged by load events (a) and (b). Experiments on high chemical load (c) are still ongoing. The plants' health was generally similar for all configurations and removal performances for BOD_5, COD and MBAS were good for all configurations.

How to cite: Costamagna, E., Fiore, S., Rizzo, A., Masi, F., and Boano, F.: Stress tests on a modular green wall for greywater treatment, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-15256, https://doi.org/10.5194/egusphere-egu23-15256, 2023.

Supplementary materials

Supplementary material file