Irrigation systems in green walls: Evaluation and management

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The green walls are expanding in big cities not only by their improvement in the landscape, but their environmental benefits for the population. Since these walls are placed along the vertical direction, the drip irrigation system is different form the typical green areas, requiring different technics to obtain a proper uniformity in water application.

This work fulfil the lack of experimental measurements of soil water content, uniformity in water application and irrigation efficiency in the green walls irrigation systems reported in the literature. Thus, it assesses the green wall placed over the East façade of the itd-UPM bulding (Centro de Innovación en Tecnología para el Desarrollo Humano) which is located at Ciudad Universitaria de Madrid in Spain.

The methodology proposed addressed the following objectives:
a) Characterize the behavior of irrigation system and their components (drippers, tubes..) though the study of pressure variability within the system and evaluation of drippers in an emitter testing bench.
b) Characterize the water retention curve of substrate; assess the uniformity in water application through the measurements of substrate water content at selected points and study the variables that could affect it by mean of and ANOVA factorial analysis.

The green wall presented two clear hydrozones with different water content: one in the lower part (with the highest water content), and the other in the upper part (with the lowest water content). This is caused for the accumulation of the percolation water at the bottom of the green wall coming from the upper area. Thus, the irrigation criteria must consider the equilibrium between the two hydrozones avoiding problems such as: suffocation of the root system and water deficit.
Considering the present irrigation management, the uniformity water application was estimating by the Christiansen coefficient CU= 81 % which is low for a trickle irrigation system. This might be caused both for the border effect and the percolation water.

The application of water in the irrigation system might improve by programming daily short irrigation events to decrease percolation; modifying some elements of the irrigation systems such as drippers in critical areas; making the green wall design to adapt to the vegetal species to the different hydrozones, and modifyng the irrigation intervals.