PYROLYSIS OF ORGANIC SIDE STREAM MATERIALS FOR THE PRODUCTION OF BIOCHAR AS AN AMENDMENT IN GREEN ROOFS: CHARACTERIZATION AND FIELD EXPERIMENTS

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Green roofs offer a solution to worldwide problems in cities like: the urban heat island effect, floods and the loss of rural regions. Nevertheless, the widespread application of green roofs still faces some serious challenges, e.g. an excessive amount of drainage water, an excess of nutrients in this water, and plant mortality in periods of severe drought. Also, the production process of the components of these substrates, such as expanded clay, is not environmentally and energy-friendly. Biochar amendment in green roof substrates can help to overcome these problems because of its valuable properties like a high nutrient content, high waterholding capacity (WHC), low density and its self-sustaining production process.

In this research, biochar is produced from six different side streams in a pilot-scale rotating kiln carbonization reactor (kg/hour input). These side streams consists out of: MDF, date palm, coffee skins, tree bark, olive stones and a waste wood mix. The produced biochars are characterized with multiple physico-chemical analyses like biochar yield, elemental composition, surface functional groups, morphology, WHC, cation exchange capacity and polyaromatic hydrocarbons (PAH's). Furthermore, a techno-economical analysis is performed on the large-scale production of these biochars.

Small scale (0,25 m2) and field experiments (2.5 m^2) with biochar incorporated in commercially available green roof substrates in the temperate climate of the Netherlands and Belgium examine whether biochar can offer a solution to the described problems. Based on the analyses of the biochar, in particular the PAH's and elemental composition, and the small scale growth experiments, two different biochars made from the waste wood mix and tree bark in concentrations of 1 and 5 % are selected for the field experiments.

Growth of Sedum plants is monitored with digital imaging processing over a period of several months, starting from November 2018. Several chemical and physical parameters are monitored and linked to the properties of the biochar incorporated substrate like pH, conductivity, nutrient leaching and waterholding capacity.