BIOCHAR CHARACTERIZATION OF RAW VERSUS SPENT COMMON IVY: INORGANIC NUTRIENT BEHAVIOR

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Hedera sp., common Ivy, a lignocellulosic evergreen vine, is commonly seen in gardens and yards all over the globe. It is an excellent candidate to be applied in vertical green walls to improve ecosystems in future green cities (e.g. fine particulate matter adsorption). These green walls need to be trimmed regularly, thus leaving a major residue stream which could be promising as biomass feedstock for biochar fertilizer production. However, common Ivy contains valuable compounds (e.g. etheric oils and triterpene saponins) increasing the process' added value. These should preferably be extracted prior to thermal conversion. The aim of this study is therefore to investigate the influence of extraction methods on the final properties of common ivy's biochar using conventional pyrolysis. Investigated extraction methods include a Soxhlet ethanol extraction and a steam distillation, to obtain respectively a triterpene saponin and volatile oil extract. The influence of these extractions on the biochar properties was studied by comparing the thermal conversion and biochar properties of spent, extracted, biomass with raw biomass. Studied properties include biochar yield, elemental composition (CHNO), amount of inorganic nutrients, specific surface area, and presence of harmful heavy metals. The guidelines of the European Biochar Certificate are used to evaluate said properties. Furthermore, the pyrolysis process parameters, temperature and heating rate, were optimized to improve said biochar properties for application as fertilizer. Tested pyrolysis temperatures were 400, 550 and 700 °C. Results show that biochar yield from raw ivy was inversely proportional with pyrolysis temperature ranging from 29.6 ± 0.6% at 400 °C, 25.4% ± 0.03 at 550 °C and 23.0 ± 0.06 % at 700 °C. It was found that steam distillation lowers the amount of heavy metals in the material, whilst the inorganic nutrients are retained, thus enhancing the biochar's potential as fertilizer. Furthermore, nitrogen content remained constant, around 2%, before and after pyrolysis both for raw and spent ivy, these results indicate that high-quality biochars were produced. To further understand biochar's chemical behavior in soils, structural properties and morphology are being investigated further, specific surface area via BET, general pore structure using SEM, surface functional groups with FT-IR and, aromaticity with CP/MAS 13C NMR results will be presented accordingly.