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PRODUCTION OF HIGH VALUE BIO-RESOURCES FROM TREATMENT WETLAND BIOMASS

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Treatment wetlands (TW) technology is a NBS, where natural processes are optimized to improve water quality. TWs are characterized by relative low establishment costs, robustness, and are easily operated and maintained. According with Brix (2018) "TWs are often considered a more sustainable solution to treat many types of wastewater compared to other more conventional treatment technologies. The role of the plants in TW have been extensively discussed, however, the studies very seldom evaluate the potential of biomass to produce high value products using advanced bio-refining technologies, and therefore representing a gap of opportunity for CW technology. Biorefining processes for the manufacturing of high value plant-based products have been extensively studied; nonetheless, few studies have been focused in the evaluation of the potential of biomass coming from TW were plants were part of a wastewater treatment.

This study is a first approach to recover high value products from biomass harvested from TW. The study compared the biomass production yields, assessed the sugar species, and proteins for 5 different plant species used in TW, growing in natural conditions (NC) vs the same plant species treating polluted waters. The study aimed at assessing the feasibility of the plants to produce cellulose, isolated protein, and biocrude. Additionally, the biomass was characterized for the accumulation metal and heavy metal content to evaluate the possible translocation from water to the aerial part of the plant, used to produce isolated protein.

The result show that the selected biomass form all the plants harvested is suitable for protein, cellulose, and biocrude production. The protein content was significantly higher form the plants harvested from TW compared to those growing under natural conditions. The cellulose production showed similar trend. Regarding biocrude production, the results showed no differences between the yields obtained from the plants growing TW compared to the ones grown in natural conditions. The protein yield range obtained was from 2.7% for *Phragmites austrialis* grown in NC to 7.7% for *Phragmites australis* grown in TW, (plants harvested in June). The cellulose content was reported between 205 mg/g for *Salix viminalis* grown in NC, to 503 mg/g for *Typha latifolia* grown in TW. The obtained biocrude yields were obtained from 20% for *Phragmites austrialis* grown in TW to 44% for *Typha latifolia* grown in NC.

The environmental value of the plants lies on the fact that the biomass from this type of treatments is considered a residual product and up to now, no aggregated value has been found from this low carbon foot print, GHG sinks, effective water treatment. Additionally, the production of the plant biomass oin TW, does not require land since they are part of the system and sufficient nutrients for the plant developments and are found in the influent waters.

Under this new perspective, TWs can contribute to the production of valuable products as well as to meet the UN sustainable development goals related with water, but also objectives such as those dealing with industry, innovation and infrastructure, and the responsible consumptions and production.

Although the results are promising and relative good results in terms of production yields, further studies should be performed. The studies should further evaluate primary production of the plants, digestibility of the produced protein, uses of the cellulose and sugar obtained, and the composition of the biocrude to optimize the potential and the quality of the products in the context of the circular economy.

BIO (50-word maximum): M.Sc. Marco A. Rodríguez-Domínguez is as PhD candidate at the Aarhus University. He has nine years of experience with constructed wetlands and water resources management.

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