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Industrial biotechnology for green waste valorisation : Biogas and biostimulant production

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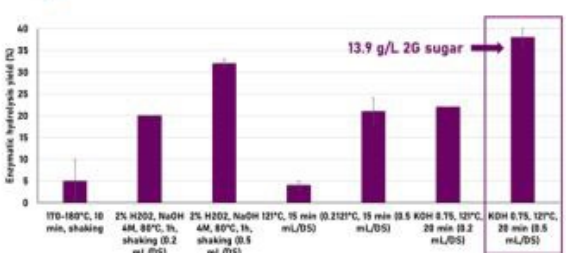
One of the primary biomass waste streams generated in urban areas is garden waste, driven by rapid urbanisation and the creation of green spaces. Garden waste includes organic materials like pruning, grass clippings, leaves, and wood, along with inorganic materials such as stones and soil. Current practices for managing organic waste, such as composting and incineration, are limited in their ability to produce high valueadded (HVA) products. The success of integrated biorefinery strategies lies in developing innovative ways to utilise these biowastes for recovering HVA products. The HOOP Project helps to unlock bio-based investments and deploy local bio economies in Europe through a systemic and cross-cutting approach aimed to obtain HVA products. Specifically, a promising approach is the extraction of secondgeneration (2G) sugars through industrial biotechnology processes from these waste streams, which serve as nutrients for microbial biostimulant cultivation or biogas production. However, green waste is a lignocellulosic material with complex structures that often is resistant to biodegradation by hydrolytic microorganisms, making pre-treatment and hydrolysis critical steps in the biotechnological process. In this project, pruning waste pretreatment and hydrolysis methods were optimised by testing various thermal and chemical conditions, along with enzymatic cocktails containing cellulolytic enzymes. A conversion yield of 40% was achieved using a combination of chemical and thermal pretreatments, paired with a βglucosidase/cellulase cocktail. The resulting 2G sugars were successfully utilised to produce HVA products, including biogas and Bacillus spp.-based biostimulants. Notably, biogas production from the hydrolysed broth was seven times higher than that from conventional green waste, and Bacillus spp. growth reached approximately 108 CFU/mL. These results suggest the potential for valorization of green waste into industrially relevant products for different applications.

Image



Biography

Mar Tronch graduated in Biochemistry Biomedical Sciences and obtained a Master's Degree in Research and Development in Biotechnology and Biomedicine at the University of Valencia. In addition, she graduated cum laude as an Industrial Doctor due to her work in the application patent development of a compound with neuroprotective potential at Bionos Biotech SL. She also has 4 years of experience in the Biotechnology Industry developing valuable solutions for more than 30 customers through the research and execution of dozens of projects that drive innovation in the bioferinery and human health market. Throughout her career, she has also participated in the development of products with industrial application in collaboration with other national and international companies and research centers.

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