

GARDEN WASTE VALORISATION DEPLOYING INDUSTRIAL BIOTECHNOLOGY: FROM BIOGAS TO BIOSTIMULANTS APPLICATION.

Mencher, A.¹; Serpico, A¹; Tronch, M¹; Bartolomé, C.¹, González C.¹, and Domenech R.¹

¹ ITENE Research Centre, Valencia (Spain)

One of the main biomass waste streams produced in urban areas is garden waste due to the fast urbanisation rate and the provision of urban green spaces. Garden waste consists of organic materials like pruning, grass clippings, leaves, and wood, as well as inorganic materials like stones and soil. Current management practices of organic wastes include composting and incineration. However, these methods do not allow obtaining high value-added (HVA) products. The key to success of the strategies on an integrated biorefinery approach lies in exploring and developing various ways to utilise those biowastes for their subsequent recovery of HVA products. Via industrial biotechnology, it is possible to obtain 2G sugars from those streams, which can be used as a nutrient source to grow microbial biostimulants or to produce biogas. Particularly, lignocellulosic materials can be inaccessible to hydrolytic microorganisms due to their complex structures and hence difficult to be biodegraded, so pre-treatment and hydrolysis processes can be rate-determining steps. In this work, pruning waste pretreatments and hydrolysis processes were optimised by testing thermal and chemical conditions, as well as enzymatic cocktails deploying cellulolytic enzymes. A conversion yield of 40% was achieved by combining chemical and thermal pretreatments and a β -glucosidase/cellulase cocktail (1:3 ratio), obtaining 2G sugars that were used to produce HVA compounds, such as biogas and *Bacillus spp.*-based biostimulants. Results indicate 7-fold net biogas production obtained from the hydrolysed broth compared to conventional biogas production from green waste, and *Bacillus spp.* growth of approximately 10^8 CFU/ml in 2G-hydrolysed broth.