

Valorising Urban Organic Waste Streams Through Agrochemical Extraction and Organic Acid Production via Cascading Biorefinery Approach

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Abstract

The CircBioCityWaste project is based on the vital principle of the ‘circular bioeconomy’ focusing on the sustainable, resource-efficient valorisation of anaerobic digestate, from urban waste streams (mainly, wastewater treatment plants, dairy processed sludge (DPS), food waste, and organic fraction of municipal solid waste (OFMSW)) to produce bio-based agrochemicals (biostimulants and biofertilisers) and organic acids via the cascading biorefinery concept. The project focuses on an ‘end-of-waste’ approach to producing deliverables for sustainable agriculture, promoting plant growth, and improving soil health while keeping circular bio-economy aspects in the focus. The biorefinery starts with digestate collection, characterisation, development of pre-treatment methods, and novel extraction technologies for agrochemicals and bio-fertilizers recovery. The potential for organic acid production from OFMSW will be examined via microbial fermentation and optimised thereafter. While the residual sludge will undergo biochemical and mineral profiling and be evaluated for use as solid ash-fertiliser. The impact of both biostimulants and biofertilisers will be benchmarked against the current best agronomic practice in commercially important plants over pot-trials under controlled conditions.

Additionally, CircBioCityWaste will evaluate the sustainability of multiproduct biorefinery and assesses the economic, social and environmental impacts of the developed products/materials or processes using life-cycle assessment methodologies. To conclude, a comprehensive perspective on the opportunity and challenges of exploiting urban waste as a valuable resource will be scrutinised.