SINTESI DI ACIDI ALCHENOICI DA POLIIDROSSIALCANOATI - Progetto "CROtonic acid from Sewage Sludge" LIFE21-ENV-IT-CROSS-LIFE" (Grant Agreement n. 101074164)

Research Project

Sludge produced in the EU by treatment of urban and industrial wastewater (WWTS) is 6 and 4 Mt/y on a dry basis. The organic matter contained in WWTS is enormous and the introduction of novel strategies that can valorise WWTS as feedstock for the synthesis of bio-based chemicals is a win-win approach in terms of circular economy and fossil resource exploitation.

The CROSS-LIFE project will play a novel role in the panorama of "WWTS-to-chemicals" projects by converting the organic content of in WWTS into a specific drop-in chemical (crotonic acid), without consuming new resources/feedstock, and simultaneously decreasing the volume of WWTS to be disposed. Crotonic acid, currently 100% fossil-based, finds application in coating, paint, textile, adhesives, ceramics, and agrochemical industries, with a global production of 60000 t/y and a selling price of 7-10 €/kg.

The technology involves the combination of thermochemical (e.g. hydrothermal carbonization) and biological microbial mixed culture (MMC) to produce bacteria containing polyhydroxyalkanoates (PHA), which will be furtherly converted to crotonic acid by means of a novel thermolytic distillation procedure.

Activity Plan

In the context of the CROSS-LIFE project, the fellow's activity will include three major tasks:

1. Production of PHA-rich microbial biomass through the set-up, monitoring and running of a prototype device.
2. Study of the novel thermolytic distillation procedure applied to both isolated PHA and PHA-inclusions inside bacteria: set-up and monitoring of a lab scale apparatus to provide the information required for pilot plant engineering; analytical characterization of the outputs.
3. Contribution to the design, manufacturing and testing of pilot scale equipment for thermolytic distillation of PHA and PHA-enrich bacteria; obtaining of crotonic acid with purity > 98%.