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Upcycling of Polyethylene terephthalate (PET) wastes to generate biodegradable bioplastics for food and drink packaging

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Plastic packaging is highly problematic for waste management and the environment; rates of littering and environmental leakage of plastics remain unacceptable. Polyethylene terephthalate (PET) is one of the primary plastics used in food and beverage packaging, around 19%. The sustainable management of these plastic wastes has become a challenging problem for the global society. There is a significant challenge to developing technologies to deal with the upcycling of plastics for food & drink packaging, transforming them into new materials or products of better quality. The European upPE-T project aims to turn plastic food and drink packaging waste into a valuable resource for making PHBV biodegradable bioplastics. To achieve this goal, we are working on developing biocatalytic degradation routes to break down one of the most commonly used packaging plastics: PET. PET wastes from post-consumer bottles were subjected to a combined treatment of heat plus quenching to decrease molecular weight and the crystallinity of PET and facilitate the enzymatic degradation by PET-degrading enzymes. PETase was produced in Escherichia coli, and differently treated PET samples were tested for enzymatic degradation, and PET samples with high degradation were identified. The resulting products from enzymatic PET degradation (mainly terephthalic acid, TPA) were used in fermentation strategies as feedstock to produce polyhydroxyalkanoates (PHAs), which are biodegradable bioplastics. The adapted protocol was successfully scaled up for the degradation of 150 g of PET. The upPE-T project has achieved the upcycling of PET wastes obtaining high-value products (biodegradable bioplastics) of applicability in different sectors.

Biography

Salvador García holds a degree in Biotechnology from the Faculty of Experimental Sciences of the University of Almería (Spain) and a MS in Biotechnology applied to Health and Sustainability. He is a specialist in the synthesis of biopolymers from bacteria and archaea. He is currently pursuing a PhD in the production of polyhydroxyalkanoates from different waste sources using halophilic microorganisms as cell factories to achieve a circular economy.

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