

New sustainable, functionalized and competitive PHB material based in fruit-by products getting advanced solutions for packaging and non-packaging applications

PHBOTTLE aims to produce a **new packaging** for fruit juices, which is **biodegradable** and has **antioxidant properties**; a packaging made from sugars and other residues rich in carbon, nitrogen and oxygen present in the wastewater from the fruit juice industry. The project will apply the latest advances in microencapsulation, biotechnology and packaging technologies.

The fruit juice industry generates enormous amounts of wastewater (>34 200 M gallons), which is rich in organic matter (mainly fermentable sugars).

The diagram illustrates the Life Cycle Analysis (LCA) of PHB production and recovery. It is a circular process with the following stages and components:

- FRUIT JUICE PACKAGING SECTOR**: Represented by an icon of a factory and oranges. It leads to **FRUIT JUICE PACKAGING**.
- FRUIT PROCESSING WASTEWATER**: A stage in the cycle, represented by a grey arrow pointing to the next stage.
- PHB BIOPRODUCTION AND RECOVERY**: Represented by an icon of a flask on a stand. It includes inputs:
 - Microorganisms Fermentation
 - Cellulose fibres
 - Encapsulated ingredients
- PHB IMPROVEMENT OF PROPERTIES**: Represented by an icon of a beaker. It leads to **PROCESS injection blow**.
- PROCESS injection blow**: A stage in the cycle, represented by a grey arrow pointing to the next stage.
- New package: BOTTLE**: Represented by an icon of a bottle. It leads to **FRUIT JUICE PACKAGING**.

The central text is **Life Cycle Analysis (LCA)**.

The improved biopolymer will be processed to produce food packaging, bottles (bottle, cap and sleeve).

Cellulose fibres, obtained from natural sources, will be used to improve the properties of PHB.

Microcapsules with **antioxidant properties** will be added to the plastic material in order to develop an active packaging.

The new material will be suitable for other **food and non-food applications** (pharmaceutical) and for **non-packaging applications** (automotive sector).

LCA is an integral part of the project; the **environmental impact** of the production and performance of the new bottle will be assessed, by comparison with existing alternatives.

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