European Innovation Council

Funded by the European Union

BioLaMer

FACTSHEET II

PROOF OF PRINCIPLE FLY LARVAE BIOREFINERY FOR BIOPOLYMER PLASTIC PRODUCTION

The BioLaMer project, funded by the EIC Pathfinder Open under Grant Agreement No. 101099487, was launched to address two critical global challenges: food waste accumulation and reliance on petrochemical plastics. The project sought to validate a novel circular value chain approach by demonstrating the viability of a fly larvae biorefinery, using Black Soldier Fly Larvae (*Hermetia illucens*) as a high-impact feedstock. Through this integrated platform, BioLaMer focused on extracting two key biopolymers: chitosan and polyhydroxyalkanoates (PHA), and showcasing their practical potential by converting them into value-added products.

2023-2026

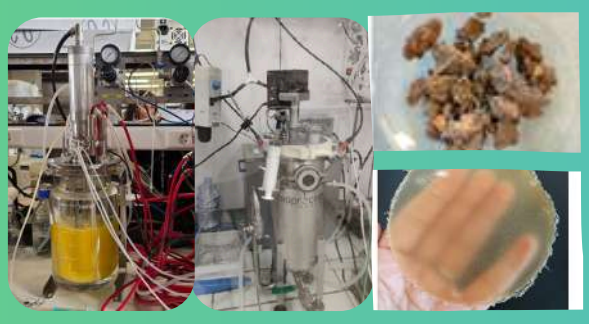
4 Academic Institutions + 3 SMEs

2.95 Million Euros

LABORATORY ADVANCEMENTS

- BioLaMer has designed and developed a larvae cultivation system incorporating controlled environmental parameters to ensure optimal hatching and growth conditions for BSF larvae.
- The system has been validated and refined to enhance operational efficiency, and production batches are now being successfully supplied to project partners.

Larvae Bioreactor



Route 1 PHA Bioreactor

Route 3 Larvae biomass & mcl-PHA film

- BioLaMer has developed three production pathways for PHAs and optimized two efficient routes for synthesizing short-chain-length (scl-) and medium-chain-length (mcl-) PHAs, including poly(3-hydroxybutyrate-co-3-hydroxyvalerate) PHBV, from BSF larval-derived biomass compounds under controlled bioreactor conditions.
- The characterization of these biopolymers confirmed their formation with adequate purity and structural integrity, making them suitable for the intended applications.

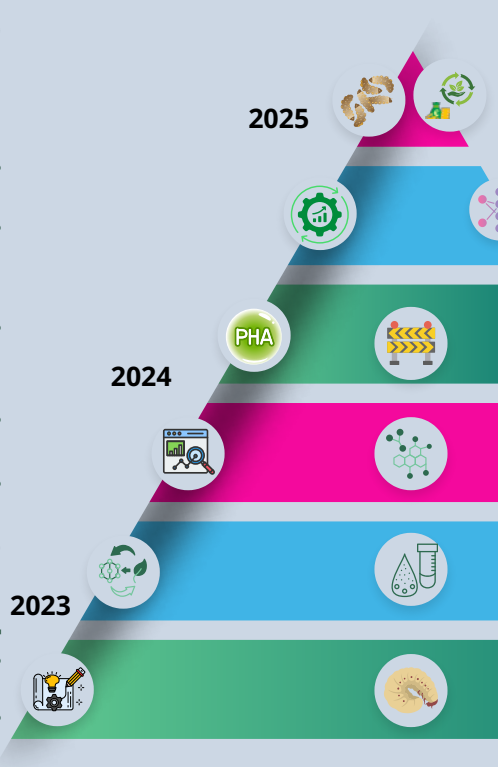
- BioLaMer has successfully separated the shells from BSF larvae and extracted both chitin and chitosan.
- All natural superabsorbent biopolymers[1] have been developed, demonstrating an exceptional water uptake capacity, absorbing over 3000 times their own dry weight.

Chitin & Chitosan

Superabsorbent biopolymer

BioLaMer Milestones

Communication , Dissemination & Exploitation



2025

- Operation of an optimized larvae-cultivation system in batch mode.
- Identifying key sustainability & economic hotspots within the biorefinery process.
- Optimized chitosan extraction from shells and PHA production from larval derived biomass.
- Implementation of Physics-Informed Neural Network (PINN) models for bioreactor modeling.

2024

- Production of scl- and mcl-PHA from larvae-derived biomass fractions.
- Identification of key barriers to bioplastics commercialization.
- Development of a hybrid AI model for supercritical CO_2 extraction.
- Optimization of the larvae bioreactor system.
- Extraction of chitin & chitosan.
- Production of PHA.

2023

- Material characterization.
- Collection of qualitative LCI data for all BioLaMer processes.
- Development of a superabsorbent biopolymer.
- Development of larvae cultivation Prototypes.
- Implementation of larvae shell separation processes.
- Extraction of larval oil.

References:

1. *https://innovation-radar.ec.europa.eu/innovation/56059*
2. *https://open-research-europe.ec.europa.eu/articles/6-36/v1*

Patent Applications

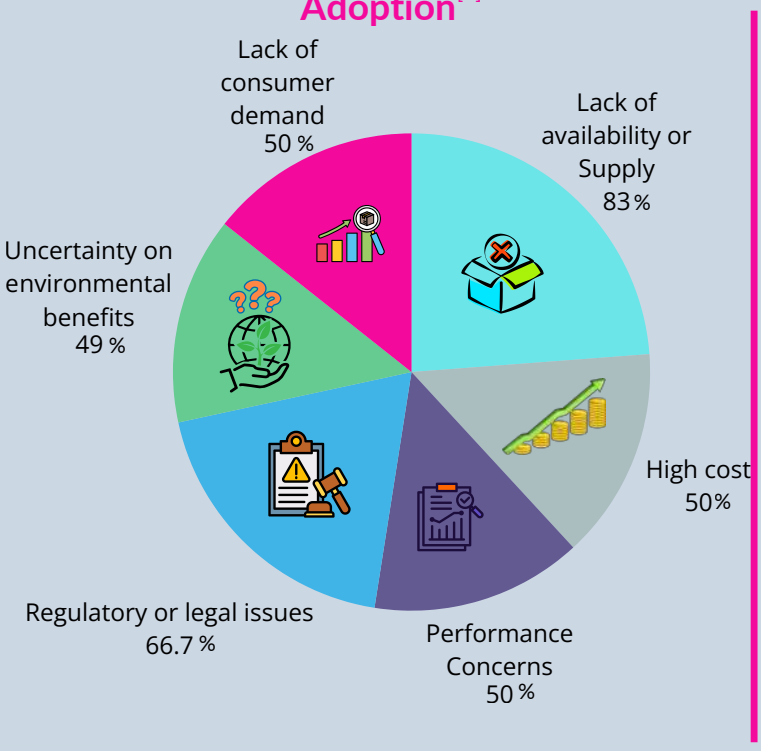
Two innovations have been recognized by European Commission's Innovation Radar and two patents have been submitted representing the BioLaMer project.

- Super-absorbent biopolymer (SAB) materials and methods of preparation thereof.
- Preparation of polyhydroxyalkanoates (PHA) from insect larvae biomass.

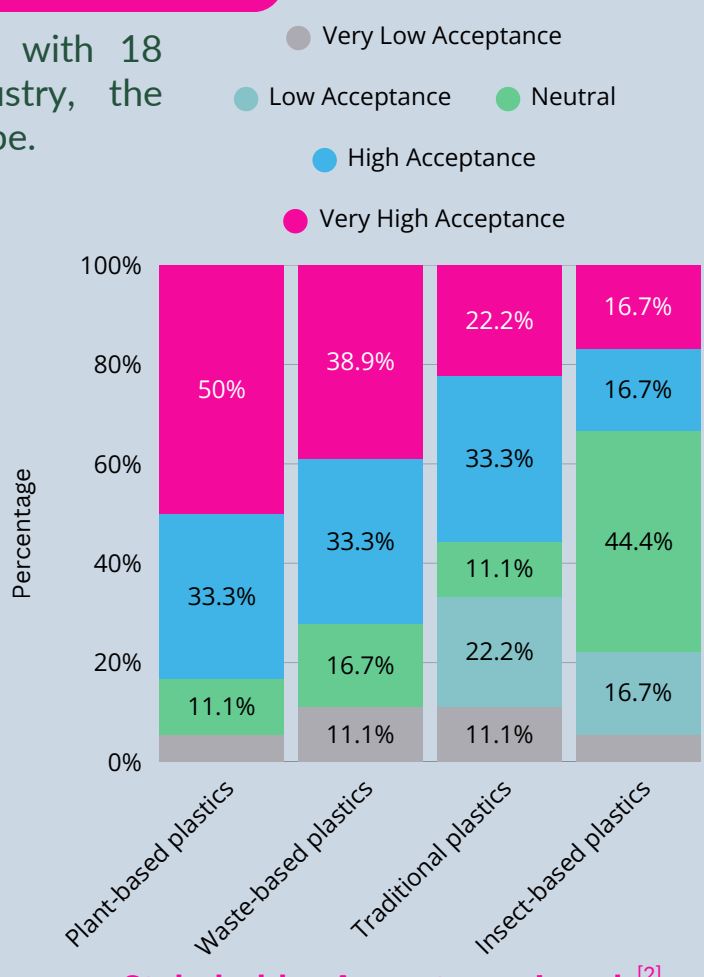
Policy Document Publication

An online questionnaire was conducted with 18 stakeholders from the bioplastics industry, the majority of them (89%) were based in Europe.

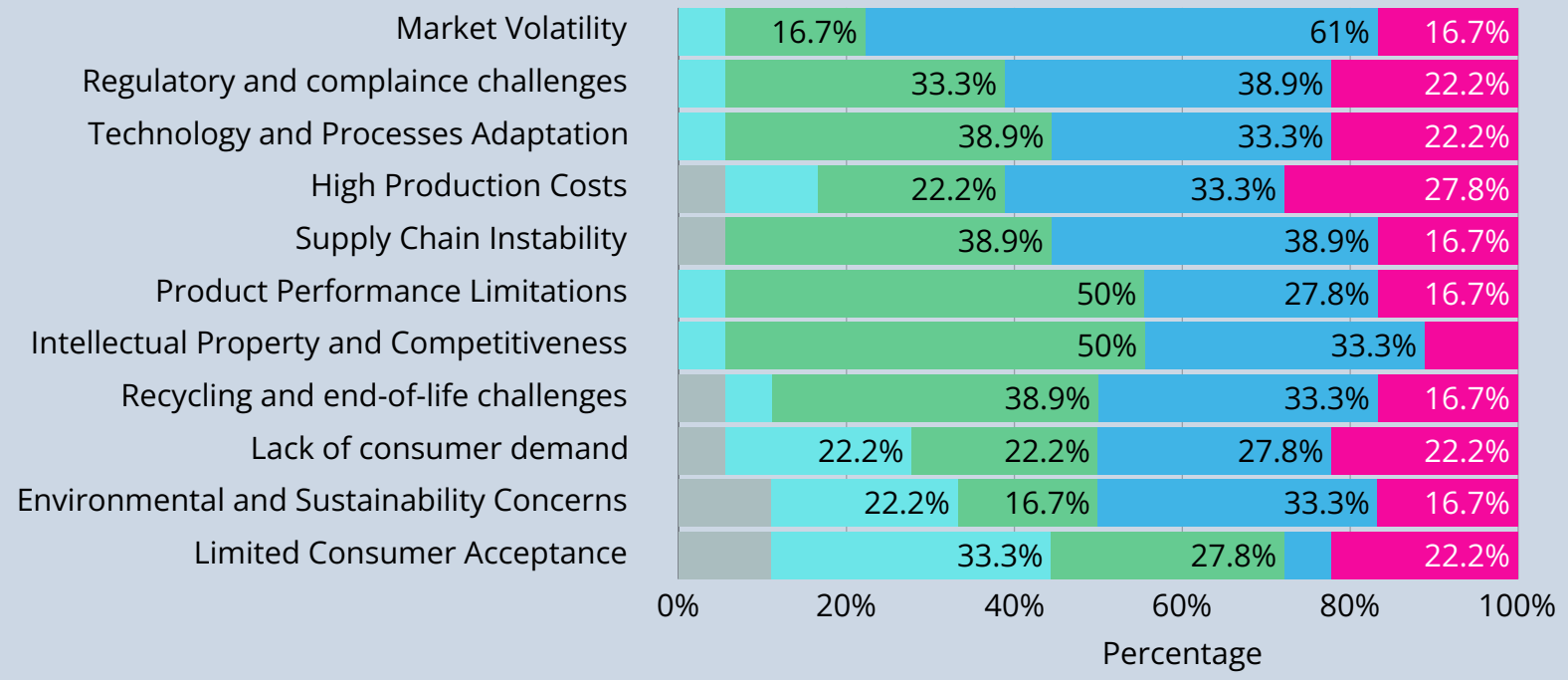
Barriers Preventing Bioplastics Adoption[2]



Stakeholder Acceptance Levels[2]



Risk Companies Facing when Working with Bioplastics[2]



TARGET AUDIENCE & STAKEHOLDER

DISSEMINATION ACTIVITIES

BioLaMer disseminated and promoted its results through peer-reviewed open access scientific publications, dedicated workshops and active participation in conferences and exhibitions.

Publications 6

Oral presentations 25

Posters 11

Workshops 3

Public Events 11

Poster Awards 3

These activities strengthened stakeholder engagement, facilitated knowledge transfer, enhanced visibility and exploitation potential of the project outcomes.

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