



LIFE14 ENV/IT/000744

PLA₄COFFEE

AFTER LIFE PLAN

THE PROJECT

Coffee capsule global market has reached the number of 48 million units sold in 2016. Western European countries and North America are the biggest markets accounting for up to 70% of global production.

Beside aluminum, plastic, thanks to its easy processability and low cost, is the material of reference for coffee capsule manufacture. More than 70% of coffee capsule are currently made with convention plastics such as Polypropylene and PBT.

Coffee capsules on their different parts can be made with very several materials together such as metal, plastic and ground coffee powder. After use, since there is no way to separate the metal or plastic materials from the exhausted organic coffee powder, coffee capsules and the single or multiple portion's wrapping material is brought to landfill creating huge environmental issues.

The introduction of a bio-compostable material (PLA) for the manufacturing of compostable coffee capsules is a viable solution to the growing environmental issue.

In this context, LIFE-PLA4COFFEE project n. ENV/IT/000744, an initiative proposed and financed under the LIFE 2014 Programme of the European Union, validated the use on industrial level of new polymer formulations with improved functional properties and based on commercial poly(lactic acid) (PLA) grades primarily for the production of compostable coffee capsules but also for the production of other consumer goods.

In details, the project was aimed to:

- Demonstrate the suitability of innovative eco-friendly materials to meet the technical specifications of the coffee industrial field;
- Convince the stakeholders that it is possible to ensure new productions with reduced environmental impact while safeguarding economic growth.

At this regard, the most important activities in the PLA4COFFEE Project from the beginning July 16th, 2015 to its finalization January 15th, 2018 have been the following:

- ✓ Design of the Pilot capsules according to products requirements
- ✓ Fine-tuning of new polylactic acid based formulations for the production of compostable coffee capsules
- ✓ Production of the fine-tuned formulations at preindustrial scale



LIFE14 ENV/IT/000744

PLA₄COFFEE

AFTER LIFE PLAN

- ✓ Realization of the coffee capsules at preindustrial scale using the injection molding technology and performances tests
- ✓ Realization of the coffee capsules at preindustrial scale using the compression moulding technology and performances tests
- ✓ Environmental and socioeconomic impact assessment
- ✓ Project dissemination and management

Main technical results obtained within the duration of the project can be summarized as follow:

- Realization of compostable formulations able to meet product requirements and ensure good processability by compression and injection molding.
- Realization of prototypes of bio-based and compostable coffee capsules on pre-industrial scale by injection and compression molding.
- Optimization of molding process parameters in order to maximize the production efficiency without prejudicing the quality standard of the molded items, and demonstrating that the proposed innovation is a concrete alternative to the current plastic materials.
- Fine tuning of the final recipe in order to reduce overall costs of the raw materials and improve the compounding process.
- Definition of the compounding line at preindustrial scale, including a new and fast quality control of the pellets (via FT-NIR spectroscopy).
- Compostability certifications (product and color masterbatches).

Benefits

We were able to summarize the benefits got from this project in the following list of tangible results:

1. **Compostable and biodegradable** according to US and EU Industrial composability regulations
2. **No recourse to nano-materials** that can be dangerous for health and environment (no working regulations in EU27)
3. **Suitable for food contact** and/or safe for humans and environments
4. **High biobased** content >96%
5. **Easy to process polymer** (extrusion; injection, compression and stretch blow molding; sheet polymer forming; thermoforming; fibers, foams ...)
6. **Tough and thermally stable** (150°C!!!!!!!!!!!!)



LIFE14 ENV/IT/000744

PLA₄COFFEE

AFTER LIFE PLAN

7. *Some numbers: Elastic Modulus (> 4.0 GPa); Elongation at break (> 10.0 %); Flexural strength (> 100 MPa); Flexural Modulus (> 5 GPa); Tensile Strength (> 60 MPa)*

Impacts

From the very beginning of the project, was clear that the market trend was towards a more sustainable business model, due to various stake holder pressure on public opinion.

Nowadays those pressure is turning into new rules, new laws and generally into a deeper awareness about the risks linked with a plastic abuse and a non structured recycle program.

Every week we can see in newspapers news about plastic ocean and beach pollutions, public and private companies joining plastic reduction programs, wider availability of public water for plastic-free cities, living without plastic webinars, straw free plastics, metropolitan cities banning single use plastics and generally reconsidering a new plastic economy.

Starting from this very favorable background, we are currently addressing several different topics to contribute simultaneously to gastronomy, coffee and environment.

We are building a strategic roadmap to widen this Pla4coffee echo with investors in food innovation, green procurement offices in large municipalities, news/blogs and magazines together with traditional coffee roasters.

The consortium

- 1) Aroma System s.r.l. (Project coordinator)
- 2) API Applicazioni Plastiche Industriali SpA (Associated Beneficiary)
- 3) Tor Vergata University of Rome (Associated Beneficiary)
- 4) Institute for Polymers, Composites and Biomaterials (IPCB) of the National Research Council (CNR) of Italy (Associated Beneficiary)

THE COMMUNICATION STRATEGY

DISSEMINATION ACTIVITIES

The partners consortium promoted the project through different actions:

- ✓ Realization of a project website to show main objectives, impact on human life, update research activities and targeted results of the initiative and that will be maintained at the least 5 years after the project's end.
- ✓ Organization of a mid-term workshop and the final project conference held in Rome at Tor Vergata University on July 14th, 2017 and in the frame of the 40th International Hospitality Exhibition (HOST) held on October 21st, 2017, at FieraMilano Rho, respectively. During these



LIFE14 ENV/IT/000744



AFTER LIFE PLAN

events the consortium partners explained the implications of the implementing measures in the plastic manufacturing industry and showed the advancement of the project through the achieved results.

- ✓ Preparation of dissemination documentation as 2 different brochures (2.000 before the mid-term workshop and 2.500 before the final conference); 5 newsletters to showcase the progress of activities, the results of the project and to announce incipient events.

Dissemination events and Conferences

Title of the event	Date and Place	Participation	Objective
ECOMONDO	Rimini, 7-10/11/17	IPCB-CNR	Dissemination of the second brochure of the project
Int. Conf. Microplastic Pollution in the Mediterranean Sea	Capri, 26-29/09/17	IPCB-CNR	Dissemination of PLA4COFFEE brochures
8 th European Weathering Symposium EWS	Vienna, 20-22/09/17	IPCB-CNR	Dissemination of PLA4COFFEE brochures and oral presentation of the contribution <i>"Water absorption and hydrothermal ageing effects on flexural properties, viscoelastic performances and microstructural evolutions of poly(lactic acid)/Jute fabric composite"</i>
MoDeSt Workshop – Nanomaterials and biomaterials for the next Decade	Pantelleria, 5-7/07/17	IPCB-CNR	Dissemination of PLA4COFFEE brochures and oral presentation of the contribution <i>"Poly(lactic acid) based formulations including dellite nanoclays: thermal, mechanical properties and morphological aspects"</i>
HOST FAIR	Milano, 29-30/10/15; 3/11/15	API	Monitor coffee capsules market developments coming from the major coffee brands and molders
ECOMONDO	Rimini, 3-4/11/15	API, AROMA	Monitor BioPlastic trends and developments in coffee capsules
EUROPEAN BIOPLASTICS CONFERENCE 2015	Berlin, 4-6/11/15	API	Monitor BioPlastic trends and developments in coffee capsules, investigate competitors, disseminate project objectives
TPE RAPRA SUMMIT 2015	Barcelona, 8-11/12/15	API	Disseminate project objectives and create networks and synergies with other projects
Fancy Food	San Francisco, 17-19/01/2016	AROMA	Participation as guest to meeting one of the most important roasters in LA to show the project PLA4COFFEE
Sigep	Rimini, 25-	AROMA	Participation with stand to the show



LIFE14 ENV/IT/000744



AFTER LIFE PLAN

	27/01/2016		
Biofach	Germany, 10-13/02/2016	AROMA	Meeting with a Dutch customer to define his requirements in terms of compostable capsules and costs.
Venditalia	Milano, 04/05/2016-07/05/2016	AROMA	Participation with stand to the show and dissemination of the project activities
K 2016	Dusseldorf 19-26 October 2016	API	Exhibitor. Monitor BioPlastic trends, investigate competitors, meet customers and suppliers, disseminate project objectives.
ECOMONDO 2016	Rimini 8-11 November 2016	API	Exhibitor. Monitor BioPlastic trends and developments in coffee capsules. Dissemination of project objective
TPE WORLD SUMMIT	Dusseldorf 29 Nov-1 Dec 2016	API	Visitor. Meetings with customers and suppliers.
INTERPACK 2017	Dusseldorf 4-5 May 2017	API	Visitor. Meetings with customers and suppliers. Monitor developments in biodegradable coffee capsules.
EOC	Gand, 16/11/2016	TOV	Presentation of project results
EUROPEAN CONFERENCE	Colonia, 14-16/03/2016	TOV	European event on use of additives products and coating/thermoplastic materials
JSP	Paris, 7-8/04/2016	TOV	Meeting with JSP micro for discussing new formulations designed for B2 e B2
GREEN AND SUSTAINABLE CHEMISTRY CONFERENCE	Berlin, 3-5/04/2016	TOV	
CHINAPLAS	Shanghai, 22/04/2016	TOV	Meeting with raw material suppliers
TRAINING	Colonia, 11-13/04/2016	TOV	Training on thermoplastic polymers
EUROPEAN BIOPLASTIC CONFERENCE 2016	Berlin 29-30 November 2016	API	Exhibitor. Monitor size, growth, driver trends and competitor landscape. Dissemination.
Sigep	Rimini, 21-25/01/2017	AROMA	Participation with stand to the show
Fancy Food	S. Francisco, 22-24/01/2017	AROMA	Participation as guest to meeting one of the most important roasters in LA to show the project PLA4COFFEE
Gulfood	Dubai, 26-02/03/2017	AROMA	Participation with stand to the show
INTERPACK 2017	Dusseldorf	AROMA	Participation with stand to the show



LIFE14 ENV/IT/000744



AFTER LIFE PLAN

	4-5 May 2017		
Sana	Bologna, 25-27 September 2017	AROMA	Participation as guest to disseminate the project results
Environment needs LIFE for the next 25 years	25-26/05/2017, Lubiana	AROMA	Participation as guest to disseminate the project results
Start Up Olè	26-27/04/2017, Salamanca Spain	AROMA	Participation to the event to disseminate the project results and activities

FUTURE DISSEMINATION PLANS

Type of activity	Date and place	Who	Source finance
Maintenance and periodic updating of the Project Website https://pla4coffee.wordpress.com/		AROMA	
Attendance of the 23rd International Trade Fair of Material & Energy Recovery and Sustainable Development where the dissemination material will be distributed	November 2019, Rimini	IPCB	Ministerial funds
Presentation and distribution of dissemination materials at the 15 th International Symposium on Bioplastics, Biocomposites & Biorefining ISBBB	July 24-27, 2018 – Guelph (Canada)	IPCB	Ministerial funds
Attendance to The LIFE 2018 Conference in Zagreb to disseminate the project results	02-03/02/2018 - Zagreb	AROMA	Ministerial funds
Attendance to EU Industry Days - 22 and 23 February in Brussels to disseminate the project results	22-23/02/2018 - Brussels	AROMA	Ministerial funds
Attendance to Green Week 2018 in Brussels to disseminate the project results	22-24/05/2018	AROMA	Ministerial funds
Attendance to Ipack-Ima 2018 in Milan to disseminate the project results and dissemination materials	29-01/06/2018	AROMA	Exhibition
Attendance to Venditalia 2018 in Milan to disseminate the project results and dissemination materials	06-09/06/2018	AROMA	Exhibition



LIFE14 ENV/IT/000744



AFTER LIFE PLAN

Attendance to Single Serve Capsules 2018 in Chicago to disseminate the project results and dissemination materials	19-20/06/2018	AROMA	Exhibition
Attendance to PCCA 2018 in California to disseminate the project results and dissemination materials	13-15/09/2018	AROMA	Conference
Attendance to Triestespresso 2018 in Italy to disseminate the project results and dissemination materials	25-27/10/2018	AROMA	Exhibition
Attendance to All Pack Indonesia 2018 in Indonesia to disseminate the project results and dissemination materials	17-20/10/2018	AROMA	Exhibition
Attendance to Gulfood Manufacturing 2018 in Dubai to disseminate the project results and dissemination materials	06-08/11/2018	AROMA	Exhibition
Attendance to Cafè Show 2018 in Seoul to disseminate the project results and dissemination materials	08-11/11/2018	AROMA	Exhibition



LIFE14 ENV/IT/000744

PLA₄COFFEE

AFTER LIFE PLAN

PROJECT DETAILS

Title: LIFE PLA4COFFEE

Reference Number: LIFE14 ENV/IT/000744

Consortium contact information:

- 1) Aroma System s.r.l. (Project coordinator)
aroma@icaspa.it – aromasystemweb.wordpress.com – fin@icaspa.it – Dott. Rapparini
Cesare/Dott.ssa Selleri Silvia
- 2) API Applicazioni Plastiche Industriali SpA (Associated Beneficiary)
api@apiplastic.com – www.apiplastic.com – Dott. Zanetti Aldo/Zanellato Stefano/
Meneghetti Marco
- 3) Tor Vergata University of Rome (Associated Beneficiary)
direzione.amministrativa@uniroma2.it – web.uniroma2.it – proff. Barletta Massimiliano,
Vincenzo Tagliaferri and dott.ssa Scribano Rosanna
- 4) Institute for Polymers, Composites and Biomaterials (IPCB) of the National Research
Council (CNR) of Italy (Associated Beneficiary)
www.ipcb.cnr.it – segreteria@ipc.cnr.it – Dott. Russo Pietro/Dott.ssa Esposito Anna

Duration: 16/07/2015 – 15/01/2018

Total Budget: 2.502.695 €

EU-funded contribution: 1.501.610 €

Web-site: <https://pla4coffee.wordpress.com/>