

# **Final Report**

**Project acronym: *ECOPLACKAGING***

**Project number: *6159***

**M-ERA.NET Call 2018**

**Period covered: 01/05/2019 to 30/09/2022**

## Publishable project summary

The development of bio-based antimicrobial packaging polymers is in great demand in order to overcome the huge environmental impact of conventional fossil-based plastic materials and guarantee food protection against physical, chemical, and microbiological effects that is why bio-based materials have attracted extensive interest in the packaging field. Among the various biopolymers, poly(lactic acid) (PLA) is the ideal choice to achieve these goals because it is compostable and can be produced from renewable resources, however, pure PLA materials also have some shortcomings, such as poor hydrophilicity, poor mechanical properties and lack of antimicrobial functionality, which limit their range of application. ECOPLACKAGING aimed to solve the drawbacks that poly(lactic acid) (PLA) currently shows for packaging applications developing a fully renewable and degradable active antimicrobial PLA composite with improved physical and mechanical properties.

Within the project ECOPLACKAGING a fully biodegradable bioplastic composite was successfully developed. This composite consisted of a PLA matrix reinforced with vegetal fibres obtained from plant waste, namely island invasive plant species (*Hedychium gardnerianum*) and coated with a low-cost and environmentally-friendly antimicrobial glasses. This novel biopolymer composite features:

- High antimicrobial effectiveness with a potential to enhance food safety
- Mechanical properties high enough for use instead of conventional thermoplastic composites
- Enhanced barrier properties over pure PLA materials
- Highly competitive direct material cost due to the low cost of the fillers and the reduction of the PLA content in the composite
- High compostability and enhanced properties in terms of nutrients.

In this project the preparation of composite mixtures polylactic acid - *Hedychium Gardnerianum* fibers in semi-operational quantities was verified and the production of composite films suitable for the subsequent production of packaging materials was tested on a semi-operational scale. Based on the obtained results, a utility model was registered at the Industrial Property Office of the Czech Republic (under number CZ36376U1) "Composite thermoplastic, environmentally friendly polymer mixture and packaging material based on it".