Publishable Summary

The overall goal of the project is to replace existing plastic coatings in multilayer paper and board-based packaging and enhance their recyclability. A coating system based on renewable raw materials derived from agrofood waste (based on whey proteins from cheese production and potato pulp from starch production) and its technological application by extrusion and lamination with paper or board to produce packaging materials for both solid and liquid food products were developed.

The first achieved target of the project focused on defining the technological needs of paper and board packaging converters in different food and beverage application sectors in a close cooperation of the industry and research partners.

In parallel, the lab scale trials stated. They firstly focused on the development of processes for extracting proteins from potato fruit juice (PFJ) and pulp. For this a number of process variations and combinations were evaluated and optimized. The most promising technology was selected and transferred into pilot scale. At the same time activities on protein modification started resulting in the development of a protein-based formulation suitable for extrusion processing. Further building on previous results, the extrudability of the proteins was achieved by applying a bio-based plasticiser as well as reactive additives. This initial formulation was continuously optimized throughout the project. This covered trials with potato proteins, the screening for alternative plasticisers and additional reactive additives as well as the application of blend partners such as potato pulp fibres and conventional polymers biodegradable or not. This resulted in the final BIO-BOARD formulation used for scale-up of the extrusion process whereby further adjustments were also made.

Extruded protein based layers were laminated with other materials such as paper, cardboard, aluminium foil and/or plastic films using adhesives to obtain multilayer packaging structures. The different laminates were used to carry out in-depth material characterisations and to recycling tests as well as packaging trials with different solid and liquid foods.

For characterisation of the laminates, resp. the stand-alone films, packaging relevant properties such as oxygen and water vapour permeability and mechanical properties were determined. Furthermore migration studies to ensure compliance with food contact legislation were carried out. Based on these results, the most appropriate laminate structures were selected for packaging trials. In these trials storage tests with four model foods were conducted. After storage time the food products were characterized regarding changes in their chemical and physical properties as well as their microbial load. Furthermore a sensorial evaluation was conducted. These tests revealed that BIO-BOARD material is well suited for packing most of the food products used: in comparison to the references used, most properties were similar of even better with BIO-BOARD material. However the sensorial properties of cocoa were affected by the novel material, and the non-aseptic conditions of milk packing at lab scale prevented a long term good microbiological state also in the reference material.

In addition, the BIO-BOARD material was also evaluated regarding its environmental performance. For this, recycling tests were carried out and an LCA was conducted. In comparison to conventional laminates, the novel structures have an improved recyclability and a suitable recycling process was identified to recover each fraction in the laminates. The significant potential for reduced environmental impact was also pointed out when reducing the amount of material used as well as when using a bio-sourced blend partner.

The public website of the project informs the target audiences on the basics of the technology, latest news and the progress of the project. The project partners also took part in number of events including 4 demonstration activities organized as part of the project, as well as a TV coverage by Euronews.

For more information: www.bioboard.eu

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