

Exploring the potential of food processing residues for biopolymers as biodegradable packaging materials and coatings

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Large amounts of food processing residues are produced each year. Most waste at manufacturing and processing facilities is generated while trimming off edible portions, such as skin, fat, crusts and peels from food. Some of this is recovered and used for other purposes, about 30 percent of food waste from manufacturing goes to animal feed and only five percent of food is composted. In addition, food waste is responsible for more than 25 percent of all the freshwater consumption each year and is among the leading causes of fresh water pollution. Food waste reduction and recycling is a prominent issue globally. The European Green Deal plan includes From Farm to Fork and circular economy themes covering food waste reduction. Nearly 140 million tons of bio-waste is generated annually, across the European Union. The recovery of compounds from food processing residues and wastes to produce bio-based packaging solutions is an active area of research. The bio-based polymeric materials possess great potential in the field of packaging for the severe environmental and human health threat of the petroleum-based packaging materials. Therefore, in recent years, there has been a growing interest in edible and biodegradable films and coatings for food packaging applications since they are biodegradable, renewable, and have a low carbon footprint.

Food processing residues are rich in valuable compounds, including biopolymers with film-forming properties (e.g. proteins, carbohydrates or lipids) and bioactive molecules with antimicrobial and health-beneficial properties. These residues represent a low-cost renewable resource of valuable molecules, which can be directly extracted (through intensive processing) or can be produced through biotechnological processes, e.g. microbial fermentation that synthesizes monomers from renewable resources such as agricultural plants, fatty acids, lignocellulosic biomass, and organic waste. Studies suggest that edible/biodegradable films or coatings derived from Polysaccharide, protein or lipid derivatives have been playing a vital role to improve the shelf life and the quality of the products such as meat, poultry, seafood, ready-to-eat foods, fresh fruits and vegetables in the food sector.

This review aims to provide valuable insights into the utilization of food processing residues as sustainable source for the development of biodegradable packaging materials and coatings. By exploring the potential of these residues, this study contributes to the development of environmentally friendly alternatives to traditional plastic packaging, reducing waste and promoting a more sustainable future.