frontiers | Frontiers in Sustainable Food Systems

TYPE Editorial
PUBLISHED 10 October 2022
DOI 10.3389/fsufs.2022.1040144

Check for updates

OPEN ACCESS

EDITED AND REVIEWED BY
José Antonio Teixeira,
University of Minho, Portugal

*CORRESPONDENCE
Danar Praseptiangga
dpraseptiangga@staff.uns.ac.id

SPECIALTY SECTION
This article was submitted to Sustainable Food Processing, a section of the journal Frontiers in Sustainable Food Systems

RECEIVED 09 September 2022
ACCEPTED 26 September 2022
PUBLISHED 10 October 2022

CITATION
Praseptiangga D, Joni IM and Tjahjono B (2022) Editorial: Advances on biopolymers derived from marine and agricultural products for sustainable food packaging applications.
Front. Sustain. Food Syst. 6:1040144.
doi: 10.3389/fsufs.2022.1040144

Editorial: Advances on biopolymers derived from marine and agricultural products for sustainable food packaging applications

Danar Praseptiangga[1]*, I. Made Joni[2] and Benny Tjahjono[3]

[1]Department of Food Science and Technology, Sebelas Maret University, Surakarta, Indonesia, [2]Department of Physics, Universitas Padjadjaran, Bandung, Indonesia, [3]Centre for Business in Society, Coventry University, Coventry, United Kingdom

KEYWORDS

marine biopolymers, agricultural products biopolymers, biodegradable films/coatings, biopolymers composites, food packaging material

Editorial on the Research Topic
Advances on biopolymers derived from marine and agricultural products for sustainable food packaging applications

Food packaging is essential in preserving food throughout the supply chain and distribution systems. Due to dwindling fossil fuel resources and the growing concern over the environmental impacts of plastic packaging waste, bio-based polymers or biopolymers have attracted the attention of consumers interested in purchasing safe, high-quality, long-shelf-life, and environmentally friendly products. The biopolymers thus present a noteworthy opportunity to contribute to the sustainable development goals (SDGs) by providing a more comprehensive range of disposal options that have the potential to reduce the negative environmental impacts of food packaging.

Bio-based polymers are typically developed from renewable resources, including marine and agricultural products. Due to their film-forming properties, they have extensively been used to produce biodegradable and edible films/coatings for food packaging. The film-forming materials, i.e., proteins, polysaccharides, and lipids, can be utilized individually or as mixed composite blends. Among the wide variety of film-forming materials, marine biopolymers and agricultural bio-products, such as alginate, carrageenan, chitosan, gelatine, cellulose, and starch, have been widely utilized due to their excellent processability, abundance, and properties. However, the incorporation and immobilization of certain substances (i.e., essential oils, nanomaterials, enzymes) with functional properties that support biodegradability and edible films/coatings are also needed in order to enhance their properties and enrich their characteristics with bioactive functionality for the development of active and intelligent food packaging systems. This Research Topic aims to present scientific progress regarding sustainable valorization of biopolymers derived from marine and agricultural products by providing a spectrum of bio-based products as high added-value materials for food packaging applications.

Recently, extensive research has been carried out on the use of marine and agricultural products' biopolymers, including chitosan, as a material for coating applications, which contributes to maintaining fruit quality and prolonging the shelf life of food products. Parijadi et al. evaluated the effect of chitosan coating in delaying fruit ripening and provided a deeper understanding of how storage at low temperatures might affect banana metabolism. Their study was the first to use a metabolomics approach to evaluate the effect of low temperature and chitosan treatments in bananas. Both treatments delayed banana ripening by delaying metabolite changes in banana fruit during the ripening process. The results may aid in the more effective development of banana postharvest strategies. The usage of chitosan as a preservation solution in postharvest treatment for strawberries was carried out by El-araby et al. Chitosan extracted by an organic acid (citric acid) during demineralization showed anti-fungal activity on the mycelial growth of *Aspergillus niger* known as a food pathogen and postharvest spoilage microorganism. The coating of strawberries by soaking in chitosan solubilized in acetic acid extended the shelf life (7–8 days) of these fruits, which are considered very sensitive to postharvest losses, by reducing deterioration microbial load, stabilizing pigmentation, and preserving cellular structures of treated strawberries.

Furthermore, the silver-alginate nanocomposite films have been successfully synthesized *via* the chemical reduction method followed by the casting method from the colloidal system by Susilowati et al. The properties of obtained silver nanoparticles were then examined, and the antibacterial activity test was performed on silver-alginate nanocomposite films using the diffusion method for gram-positive (*S. aureus* and MRSA) and gram-negative (*E. coli* and ESBL) bacteria. The results showed that nanocomposite film had antibacterial activity against *E. coli*, *S. aureus*, ESBL, and MRSA, and the silver nanoparticle concentration affected the film's antibacterial activity. Moreover, Harsojuwono et al. determined the concentrations of polycaprolactone (PCL) and anhydride maleic acid (AMA) to develop a bio thermoplastic composite (BtC) of modified cassava starch-glucomannan-polyvinyl alcohol (MSGPvA) that meets the Indonesian National Standard (SNI) and International Bioplastic Standards (ISO 527/1B, PCL from the UK, and ASTM 5336 for PLA plastic from Japan), and therefore, potential to be used as food packaging material. Finally, Arifin et al. developed corn starch var. Paragon from Indonesia and carboxymethyl cellulose (CMC) bio-nanocomposite film containing different types of plasticizers incorporated with zinc oxide (ZnO) nanoparticles (NPs) *via* casting method. The study summarized that the incorporation of glycerol or sorbitol plasticizers reinforced by ZnO NPs plays an essential role in improving the properties of the bio-nanocomposite film; hence the film has the potency to be used as sustainable and environmentally friendly packaging.

The five articles composing this Research Topic offer a comprehensive perspective on advancing biopolymers derived from marine and agricultural products for sustainable food packaging applications.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Acknowledgments

The authors thank Frontiers for all their support.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note