Review

Plant/algal polysaccharides extracted by microwave: A review on hypoglycemic, hypolipidemic, prebiotic, and immune-stimulatory effect

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ABSTRACT

Microwave-assisted extraction (MAE) is an emerging technology to obtain polysaccharides with an extensive spectrum of biological characteristics. In this study, the hypoglycemic, hypolipidemic, prebiotic, and immuno-modulatory (*e.g.*, antiinflammatory, anticoagulant, and phagocytic) effects of algal- and plant-derived poly-saccharides rich in glucose, galactose, and mannose using MAE were comprehensively discussed. The *in vitro* and *in vivo* results showed that these bioactive macromolecules with the low digestibility rate could effectively alleviate the fatty acid-induced lipotoxicity, acute hemolysis, and dyslipidemia status. The optimally extracted glucomannan- and glucogalactan-containing polysaccharides revealed significant antidiabetic effects through inhibiting α-amylase and α-glucosidase, improving dynamic insulin sensitivity and secretion, and promoting pancreatic β-cell proliferation. These bioactive macromolecules as prebiotics not only improve the digestibility in gastrointestinal tract but also reduce the survival rate of pathogens and tumor cells by activating macrophages and producing pro-inflammatory biomarkers and cytokines. They can effectively prevent gastrointestinal dis-orders and microbial infections without any toxicity.

1. Introduction

In recent year, a substantial interest in the extraction process of polysaccharides has been paid because the obtained extracts can be applied to formulate different nutraceutical, pharmaceutical, cosmetic, food, and beverage products. The conventional extraction using hot water as a solvent is not considered as an appropriate procedure for bioactive polysaccharides because prolonged times and high tempera-tures can highly destroy or change their structure and functionality (Rostami & Gharibzahedi, 2017). Several alternative methods are sug-gested to facilitate the release of intracellular polysaccharides without any change in their inherent characters during processing. These extraction techniques include enzyme-assisted extraction (EAE), ultrasound-assisted extraction (UAE), microwave-assisted extraction (MAE), and pressurized water extraction (PWE) (Guo et al., 2019; Ros-tami & Gharibzahedi, 2017; Wei et al., 2019; Yuan et al., 2019). MAE is one of the most efficient techniques to obtain target bioactive com-pounds. Electric and magnetic fields in microwaves in terms of