Purification of cress seed (Lepidium sativum) gum: Physicochemical characterization and functional properties

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ABSTRACT

The aim of the present study was to investigate the effects of different purification methods (ethanol, isopropanol and ethanol–isopropanol) on the physicochemical and functional characteristics of cress seed gum. Sugar composition and molecular weight of the samples varied significantly. All the purification methods reduced ash and protein content and molecular weight of cress seed gum. The main decomposition of the purified samples started above 200 °C and initial decomposition temperature of the crude gum was 190.21 °C. DSC thermograms of the purified gums showed two exothermic events at 257.81–261.95 °C and 302.46–311.57 °C. Crude gum displayed an exothermic peak at 259.42 °C. Sample I (purified using isopropanol) imparted the best surface activity among the purified samples as it had the highest protein and uronic acid contents and the lowest Mw. All the purification methods could improve emulsifying properties of cress seed gum and there was no significant difference among the purified samples. Crude gum showed the lowest foaming properties, while samples I and E (purified using ethanol) showed the highest foaming capacity and foam stability, respectively.

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1. Introduction

Hydrocolloids are broadly used as functional ingredients in the food and pharmaceutical systems for various purposes, and nowadays there is a great interest for natural hydrocolloids with low cost and proper functionality (Behrouzian, Razavi, & Karazhiyan, 2014; Vardhanabhuti & Ikeda, 2006).

Lepidium sativum (Garden cress) is an annual herb belonging to the Cruciferae family and the seeds contain a large amount of mucilaginous substances, which are a good source of hydrocolloids with high molecular weight (Karazhiyan et al., 2009; Naji & Razavi, 2014; Razavi et al., 2007). Karazhiyan, Razavi, and Phillips (2011) optimized the extraction process conditions of cress seed gum using response surface methodology. Some physicochemical and functional properties of the mucilage extracted from cress seeds as a new source of hydrocolloid have been recently studied (Behrouzian, Razavi, & Karazhiyan, 2013; Behrouzian et al., 2014; Karazhiyan et al., 2009; Karazhiyan, Razavi, Phillips, et al., 2011; Naji & Razavi, 2014; Naji, Razavi, Karazhiyan, & Koocheki, 2012; Naji, Razavi, & Karazhiyan, 2012; Naji, Razavi, & Karazhiyan, 2013; Razavi, Bostan, Niknia, & Razmkhah, 2011).

Gum extraction methods usually result in solutions containing a mixture of components, which have to be further purified to isolate the specific polysaccharide of interest. The purification of polysaccharides removes unacceptable flavors, impurities and endogenous enzymes of the crude gums and the purified gums give clearer and more stable solutions. Various procedures based on solubility differences or selective precipitations have been used to separate different polysaccharides such as precipitation with ethanol, isopropanol, methanol, copper or barium complexes and etc. (Bouzouita et al., 2007; Cui, 2005; da Silva & Gonçalves, 1990). Purification of locust bean gum by precipitation with isopropanol was investigated by da Silva and Gonçalves (1990). With the purification procedure used, practically all fat and fiber in the commercial sample were eliminated and the ash and protein contents were also drastically reduced. The purified gums exhibited higher mannose/galactose ratios, and were almost totally soluble and the resulting solutions were clearer and more stable than those

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