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Improved stability of food oil-in-water emulsions using cacao pods husk pectin-whey protein hydrolysate complexes

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Nowadays, the production of commercial pectin is limited to a few sources, usually lemon peels and apple pomace, thus, there is an ongoing search for new sources of pectin from regional botanical sources and agroindustrial wastes, like cacao pods husk. Pectin is gradually gaining acceptance as an effective emulsifier in numerous industrial applications, and the emulsifying and emulsion-stabilizing properties of this hydrocolloid are increasingly being assessed. It has been informed that biopolymer soluble complexes formed by oppositely charged protein and polysaccharides exhibit improved emulsifying properties than the individual biopolymers. In this work, the dynamic interfacial adsorption and emulsifying properties of cacao pod husks pectin (CP) were investigated and compared with those of a soluble complex formed between CP and Whey Protein Hydrolysate (WPH). Pectin was extracted from cacao pod husks wastes, and the diffusion (K_{diff}), penetration (K_{pen}) and rearrangement (Krea) rate constants were determined at the canola oil-water interface. Canola oil-in-water emulsions stabilized with CP (ECP) exhibited oil droplets having an initial area-volume mean diameter (d3,2) of 113.60 nm, which significantly increased to 162.0 nm during 28 days of storage at 4°C. The soluble complex (SCWPH-CP) formed by electrostatic interaction between CP and WPH in a weight ratio of 1:5 at pH 3.25, decreased the interfacial tension faster and displayed higher Kdiff and Kpen constants than CP. SCWPH-CP yielded canola oil-in water emulsions with oil droplets presenting a d3,2 of 90 nm, which did not suffer significant changes during storage. It was concluded that the greater stability of EWPH-CPHP was due mainly to steric repulsion originated by the soluble complex adsorption layers around the oil droplets.

Recent Publications

1. Vriesmann L C, Teófilo R F and Petkowicz C L O (2012) Extraction and characterization of pectin from cacao pod husks (*Theobroma cacao L.*) with citric acid. LWT-Food Sci. Technol. 49:108-116.
2. Hernández Marín N Y, Lobato Calleros C and Vernon Carter E J (2013) Stability and rheology of water-in-oil-in-water multiple emulsions made with protein-polysaccharide soluble complexes. J. Food Eng. 119: 181-187.
3. Cuevas Bernardino J C et al. (2016) physicochemical characterization of hawthorn pectins and their performing in stabilizing oil-in-water emulsions. React. Funct. Polym. 103:63-71.
4. Schmidt U S, Schütz L and Schuchmann H P (2017) Interfacial and emulsifying properties of citrus pectin: interaction of pH, ionic strength and degree of esterification. Food Hydrocoll. 62:288-298.
5. Guerra Rosas M I et al. (2016) Long-term stability of food-grade nanoemulsions from high methoxyl pectin containing essential oils. Food Hydrocoll. 52:438-446.

Biography

Lobato Calleros C pursued her PhD in Biological Sciences from Autonomous Metropolitana University, México in 1997. She is currently a Professor of Agro-Food Science and Technology and Chemistry at Chapingo Autonomous University, for more than 20 years. She has more than 15 years of experience in Food Science and Technology research and is author of more than 50 scientific publications. One of her main areas of research is the development and evaluation of colloidal systems for the protection and release of bioactives.

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