STUDY OF FUNCTIONAL PROPERTIES OF CHITOSAN-LACTOSE DERIVATIVES OBTAINED BY MAILLARD REACTION

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INTRODUCTION

Among the different strategies studied to improve chitosan solubility and extend its applications, one very promising approach is the synthesis of carbohydrate-chitosan derivatives through Maillard Reaction (MR). This reaction has potential industrial application since it is easy to control and may occur readily in the absence of solvent. In a recent work, our group has studied the effect of different drying methods on chitosan reactivity towards MR during storage of dried chitosan-lactose systems and modified chitosans were obtained [1]. MR development was assessed by quantification of a new compound formed during the acid hydrolysis of Amadori compounds resulting from the chitosan-lactose interactions (NFMD).

OBJECTIVE

The objective of the present work was to determine the solubility, water and fat-binding capacity and antioxidant activity of native chitosan and compared to those of chitosan-lactose derivatives obtained via Maillard reaction.

MATERIALS AND METHODS

CHITOSAN DERIVATIVE SYNTHESIS

Chitosan structure and composition are critical factors that influence its functionality. The objective of this study was to modify the chitosan structure and composition to obtain new functionalized derivatives with improved functionality. The functionalized chitosan derivatives were synthesized through the Maillard reaction between chitosan and lactose. The reaction was carried out under different conditions, including the use of different solvents and temperatures, to optimize the reaction parameters and obtain derivatives with desired properties.

CHROMATOGRAPHIC ANALYSIS

Hydrolysis under inert conditions

Chitosan is a derivative of chitin, a natural polysaccharide found in the exoskeletons of arthropods and crustaceans. Hydrolysis under inert conditions was performed using formic acid to obtain chitosan hydrolysates. The hydrolysates were analyzed using high-performance liquid chromatography (HPLC) and Fourier-transform infrared spectroscopy (FT-IR) to assess their composition and structure.

SAMPLE PREPARATION

Elution was performed using a mobile phase composed of water and formic acid. The elution profiles were monitored using a UV detector at 215 nm. The eluate was collected and concentrated to obtain chitosan hydrolysates. The hydrolysates were analyzed using HPLC and FT-IR to assess their composition and structure.

FUNCTIONAL PROPERTIES

SOLUBILITY

The solubility of chitosan and chitosan-lactose derivatives was assessed using a water solution at pH 7.5. The solubility was calculated as the mass of chitosan or chitosan-lactose derivative dissolved per unit volume of the solution.

WATER BINDING CAPACITY (WBC)

The water binding capacity of chitosan and chitosan-lactose derivatives was assessed using a water solution at pH 7.5. The water binding capacity was calculated as the mass of water absorbed per unit mass of chitosan or chitosan-lactose derivative.

FAT BINDING CAPACITY (FBC)

The fat binding capacity of chitosan and chitosan-lactose derivatives was assessed using a soybean oil solution at pH 7.5. The fat binding capacity was calculated as the mass of soybean oil adsorbed per unit mass of chitosan or chitosan-lactose derivative.

ANTIOXIDANT ACTIVITY

Table 1: Solubility, water and fat binding capacities (FBC) of chitosan and its lactose derivative obtained after 48h of storage at 60ºC and 40% R.H.

FUNCTIONAL PROPERTIES

REFERENCES


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