ABSTRACT

Chitin is the second most abundant polysaccharide present in nature after cellulose. It possesses unique properties such as biocompatibility, biodegradability, haemostatic activity, antibacterial activity, and the ability to promote tissue regeneration. These characteristics would make chitin an excellent material for medical applications, but its key challenge remains its limited solubility. It does not dissolve in water or conventional organic solvents, so modification methods are still being sought to produce soluble derivatives. In addition, the possibility of broader use of chitin would be highly beneficial from an environmental sustainability point of view. It would contribute to reducing waste generated by the food industry, which also fits in with the current circular economy concept. New chitin derivatives can be designed to select application requirements to maximise their beneficial properties.

This study aimed to develop a method for the synthesis of a new chitin derivative, butyryl-succinyl chitin, through the esterification reaction of chitin hydroxyl groups using butyric and succinic acid anhydrides and to evaluate its potential for application. The first stage of the work was developing the synthesis method, which included the selection of the catalyst, the ratio of substrates used and the reaction conditions allowing the preparation of a polymer with potential application for medical purposes. The possibility of using perchloric acid and methanesulfonic acid as catalysts for the esterification reaction was examined.

The second stage of the work was to confirm the change in chemical structure and degree of substitution and analyse the characteristics of the copolyesters obtained. The structure was confirmed using FTIR ATR and ^{1}H NMR techniques. Measurement of the dynamic apparent viscosity of butyric-succinic chitin solutions and thermogravimetric analysis were also carried out.

Subsequently, the applicability of the obtained polymers was evaluated by producing porous materials by salt-leaching, fibres by wet spinning method and electrospinning.

The study series showed that methanesulfonic acid was a more effective catalyst for the esterification reaction of butyric-succinic chitin. Rheological analysis confirmed the non-Newtonian nature of the polymer solutions made from BSC and allowed the selection of a suitable solvent for the polymer produced. The fibres

produced from the copolyester were found not to have the mechanical properties necessary to be processed by conventional textile methods. The possibility of producing microfibres by electrospinning and porous materials from butyric-succinic chitin with controlled hydrophilic or hydrophobic properties and absorbency depending on the content of groups derived from butyric acid and succinic acid anhydrides was proved.

The research allowed the development of a method for synthesising a new chitin copolyester, butyryl succinyl chitin, and the development of materials based on it that could find application in the medical sector.