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FAST AND EFFICIENT METHOD TO SYNTHESISE CHITOSAN FROM PRAWN SHELLS

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Chitin is the second most abundant of all polysaccharides and is found in the shells of crustaceans and the cell walls of certain fungi and algae. Chitin is insoluble in water, and deacetylation yields chitosan. Chitosan is a natural biopolymer with non-toxic, antibacterial, biodegradable, and biocompatible properties. Due to these properties, it is widely applied in biomedical applications such as drug delivery, tissue engineering scaffolds, wound dressings, and antibacterial coatings. However, the reported procedures to extract chitin from prawn shells and subsequent conversion into chitosan involve lengthy processes which take 52 – 110 h. Therefore, this study attempted to synthesise chitosan from prawn shells by optimising the individual steps involved. Extraction of chitin and conversion of chitin to chitosan consists of four main steps: deproteination, decolouration, demineralisation, and deacetylation. The deproteination step was optimised by varying the reaction time (1 to 5 h) and reaction temperatures [Room temperature (RT) to 70 °C] with 5% NaOH. The demineralisation step was optimised by varying the concentrations of HCl (1% w/v to 5% w/v) and reaction time (2 to 24 h) at RT. Time taken for decolouration was optimised using acetone and H_2O_2 at RT. It was found that with 5% (w/v), 2 h of reaction time and RT were the optimum conditions for deproteination and 5% (w/v) was the optimum concentration of HCl, and 2 h of reaction time at RT were the optimum conditions for demineralisation. Decolouration was done with H_2O_2 at RT for 2 h. Finally, the product was deacetylated with 25% (w/v) NaOH for 2 h at 100 °C. The extracted chitosan was characterised by FTIR analysis. FTIR characterisation data confirmed the successful synthesis of chitosan, and it was obtained in 7 h in 13% of yield. These results indicate that this method is a fast and efficient method to synthesise chitosan from prawn shells.

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Keywords: Chitosan, Extraction, Natural biopolymer