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DEPROTEINIZATION OF CHITIN FROM CRUSTACEANS USING BIOLOGICAL METHODS

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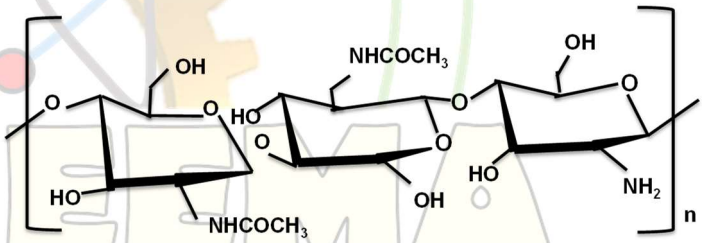
INTRODUCTION

Chitin is the second most abundant biopolymer in nature. Chitin is a linear polysaccharide composed of α-(1–4)-linked 2-acetamido-2-deoxy-D-glucose units. It is a white, hard, inelastic nitrogenous polysaccharide widely distributed in the exoskeletons of insects, crab, shrimp and lobster and also in the internal structures of other invertebrates. Shrimp shell and head waste constitute the single largest source of chitin in India. About 14-27% of dry shrimp waste and 13-15% of dry crab shell waste is chitin (No, Meyers and Lee, 1989). Annual production of chitin, in biosphere estimated with approximately 10 billion tons (Casadidio et al., 2019). The chitin and its derivatives gained importance due to their beneficial biomedical applications.

Chitin is extracted predominantly from crustaceans, insects and fungi. Though, the commercial sources of chitin are shellfishes which are supplied in huge quantities by the processing industries. Biological method of chitin extraction from crustaceans is an eco-friendly technique which involves extraction of long chain carbohydrate polymer chitin by using bacteria or commercial proteolytic enzymes. Extraction of chitin involves two steps, demineralisation and deproteinisation, which can be conducted by two methods, chemical or biological. To extract chitin from shrimp shells using traditional chemical treatment, 3 - 4% NaOH (w/v) is used for deproteinisation and 1.25N HCl for demineralization

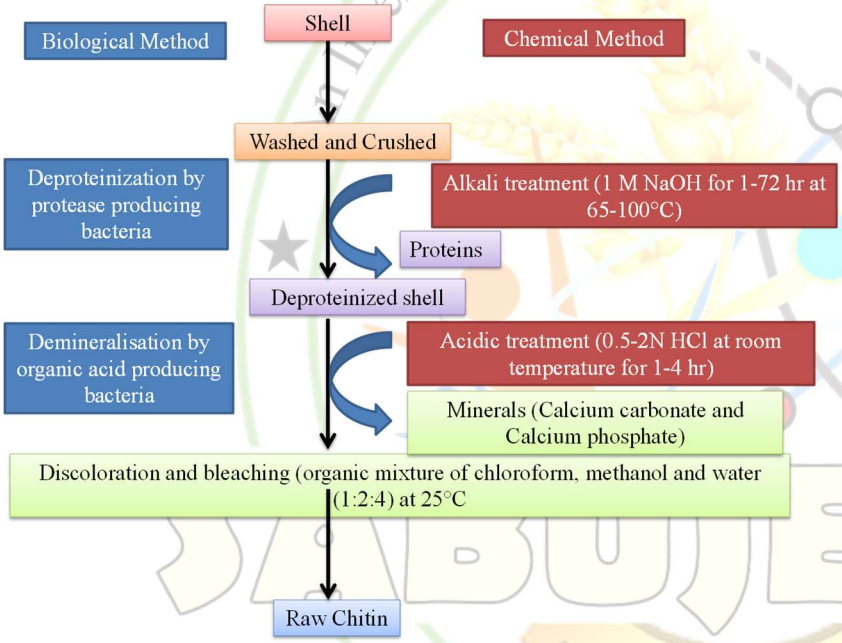


COMPARISON OF CHITIN EXTRACTION METHODS

Deproteinization and demineralization of shrimp shells using chemical extraction methods

The traditional method of chitin extraction using chemical methods has been depicted in Fig. 1. It consists of two basic steps i.e. deproteinization by alkali treatment and demineralization by acidic treatment. The predominant issue in the chitin production is the quality of final product that is a function of the molecular weight and the acetylation degree. The use of harsh acid

treatment causing inconsistent physical properties is also a source of environmental pollution. Higher alkali concentration and deproteinization temperature also causes undesirable deacetylation and depolymerization of chitin. These harsh chemical treatments also generate a disposal problem for the wastes as there is a need for neutralization and detoxification of the wastewater discharged. Moreover the protein recovered from the deproteinization step cannot be used as feed components due to the loss of its properties (Gadgey, 2017).



Deproteinization and demineralization of shrimp shells using biological extraction methods

Since the chemical method of producing chitin is harsh process and it affects the physicochemical properties of chitin, biological method could be a better alternative. The biological methods are simple; more productive and environmental friendly when compared to chemical synthesis methods. Currently, biological ways for chitin production have been reported using organic acids producing bacteria and enzymes for the demineralization and deproteinization of crustacean shells. Deproteinization of the shell waste and concurrent liquefaction of the shrimp proteins take place predominantly using proteolytic enzymes produced by Lactobacillus strains. In order to improve the efficiency of chitin extraction while maintaining the ecological nature of the process, various authors used mild chemical treatments along with biological demineralization of crustacean shells. Several methods were used for the biological method of deproteinization and demineralization (Kaur and Dhillon, 2015). They are

» **Lactic acid fermentation - mediated chitin extraction**
» **Non Lactic acid fermentation – mediated chitin extraction**
» **Co-culture fermentation strategies for chitin extraction**

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