

Identification of a novel tailor-made chitinase from white shrimp *fenneropenaeus merguensis*

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Abstract

Fenneropenaeus merguensis (commonly named banana shrimp) is one of the most important farmed crustacean worldwide species for the fisheries and aquaculture industry. Besides its nutritional value, it is a good source of chitinase, an enzyme with excellent biological and catalytic properties for many industrial applications. In the present study, a putative chitinase-encoding cDNA was synthesized from mRNA from *F. merguensis* hepatopancreas tissue. Subsequently, the corresponding cDNA was cloned, sequenced and functionally expressed in *Escherichia coli*, and the recombinant *F. merguensis* chitinase (rFmCHI) was purified by His-tag affinity chromatography. The bioinformatics analysis of amino acid sequence of rFmCHI displayed a canonical multidomain architecture in chitinases which belongs to glycoside hydrolase family 18 (GH18 chitinase). Biochemical characterization revealed rFmCHI as a monomeric enzyme of molecular weight 52 kDa with maximum activity at 40 °C and pH 6.0. Moreover, the recombinant enzyme is also stable up to 60 °C, and in the pH range 5.0-8.0. Steady-state kinetic studies for colloidal chitin revealed K_M , V_{max} and k_{cat} values of 78.18 μM , 0.07261 $\mu\text{M} \cdot \text{min}^{-1}$ and 43.37 s^{-1} , respectively. Overall, our results aim to demonstrate the potential of rFmCHI as suitable catalyst for bioconversion of chitin waste.

Keywords

Marine organisms, Chitinolytic enzymes, Molecular cloning, Protein purification, Biochemical characterization

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