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## **PROTEASE PRODUCTION FROM FISHERY WASTES FOR SUSTAINABLE DEVELOPMENT OF INDUSTRIAL BIOTECHNOLOGY IN MALAYSIA**

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### **Abstract**

Fishery waste is a significant waste commodity in Malaysia, encompassing fish processing by-products such as viscera, heads, bones, and scales, which are rich in amino acids, proteins, and collagen. Additionally, chitinous fishery by-products like shrimp shells, crab shells, and squid pens contain valuable chitinous materials. Inadequate management of this waste can have adverse environmental effects. To promote sustainable development, the circular economy approach can be employed to convert these wastes into valuable products, including bioactive compounds, enzymes, collagen, and bioethanol. This review primarily focuses on the conversion of fishery waste into protease enzyme, a proteolytic enzyme widely used in industries such as leather processing, food, detergent, and pharmaceuticals. The review assesses the potential of utilizing various types of fishery waste as fermentation media for protease production using different technologies, based on literature from 2000 to 2021. Furthermore, the essential characteristics of the produced protease for industrial applications are discussed. A simple economic analysis is proposed to compare the production of fish meal and protease using fishery waste generated in Malaysia. The results indicate that transforming abundant fishery waste into protease could yield higher profits compared to fish meal production. Overcoming the challenges associated with this endeavor requires concerted efforts to achieve sustainable development.

*Key words:* economic analysis, enzyme production, fishery waste, protease

*Received: December, 2022; Revised final: March, 2023; Accepted: March, 2023; Published in final edited form: April, 2023*

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