BIOLOGICAL EXTRACTION AND CHARACTERIZATION OF CHITIN BIOPOLYMER FROM LOCAL BANGUS *(Chanos chanos)* AND TILAPIA *(Oreochromis niloticus)* FISH SCALES WASTE

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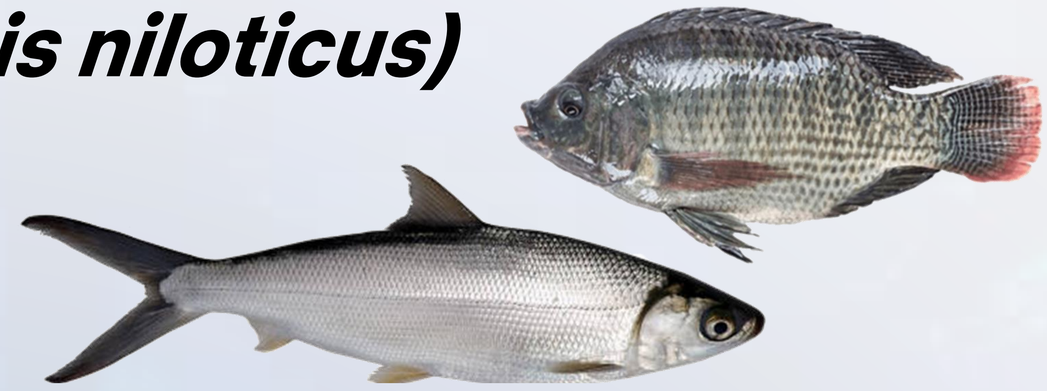
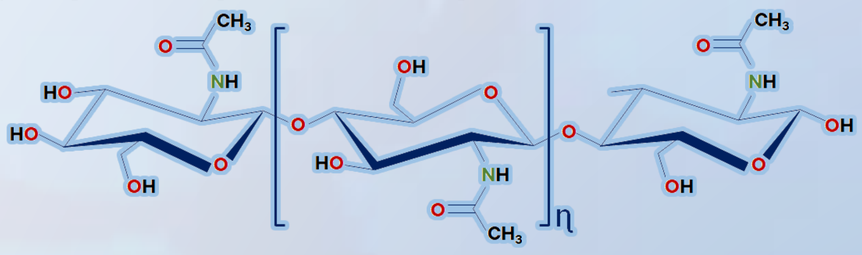


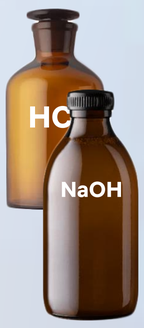
1. INTRODUCTION

In the Philippines, the main aquaculture products - Bangus and Tilapia contribute to the marine wastes together with the increase in its production. These wastes pose great danger for the environment because of their high biological and chemical oxygen demand, pathogens, and organic matters, among others



Chitin is the second most common polymer after cellulose that is usually found on crustaceous shells and fish scales. It is usually extracted using the chemical methods.

Conventional processes of chitin extraction:



Demineralization
Strong acids

Abundance of waste

Deproteinization
Strong bases

Pollution to the environment

Harmful to humans

2. OBJECTIVES OF THE STUDY

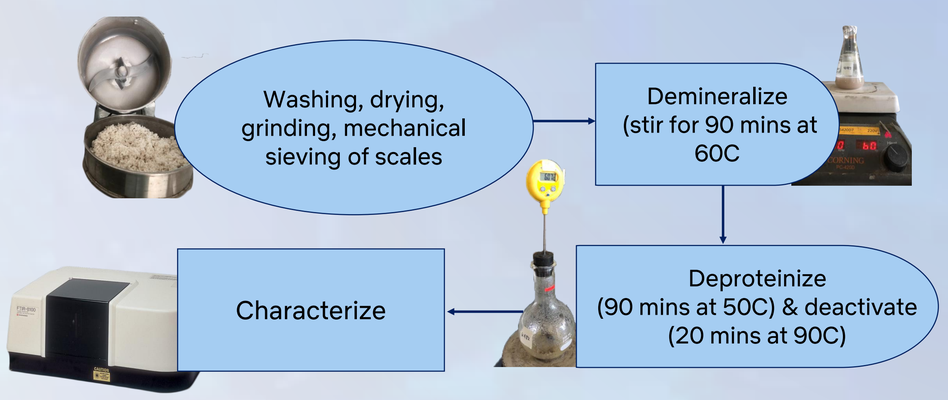
This study aimed to:

1 OPTIMIZE
scale to lactic acid ratio and water to bromelain enzyme

2 CALCULATE
percent yield of extracted chitin from Bangus and Tilapia

3 CHARACTERIZE
degree of deacetylation using FTIR, moisture content using gravimetry, and morphology using SEM

3. METHODOLOGY

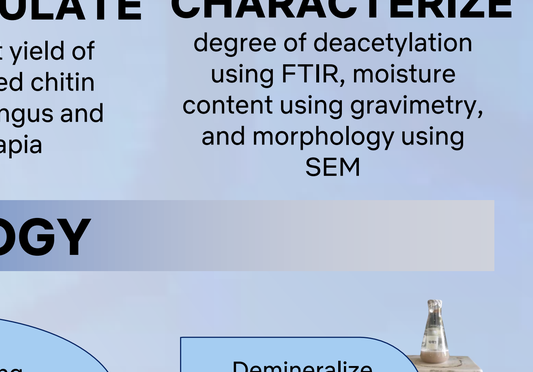


4.1 RESULTS

SCALE-ACID OPTIMIZATION

50 mL (1:10 scale to acid) for bangus demineralization

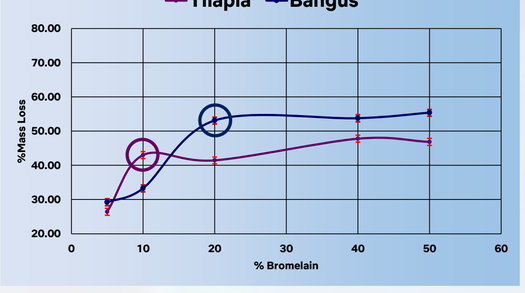
70 mL (1:14 scale to acid) for tilapia demineralization,



WATER-ENZYME OPTIMIZATION

20% bromelain (8:2 water to enzyme) for bangus scales deproteinization

10% bromelain (9:1 water to enzyme) for tilapia scales deproteinization.



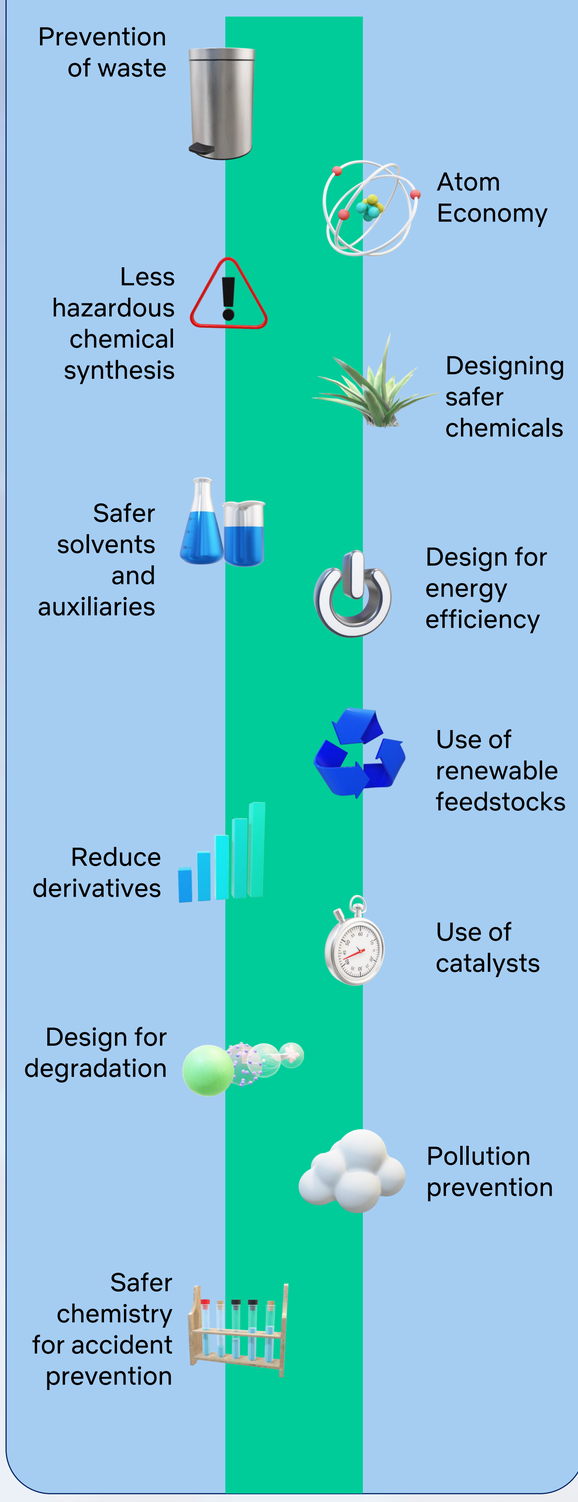
BIOLOGICAL EXTRACTION

Approach on an environmentally friendly method

Lactic acid solubilized the minerals such as $CaCO_3$ from the scales of the samples.

The patented **polyphenol-bromelain** facilitated the hydrolysis of proteins.

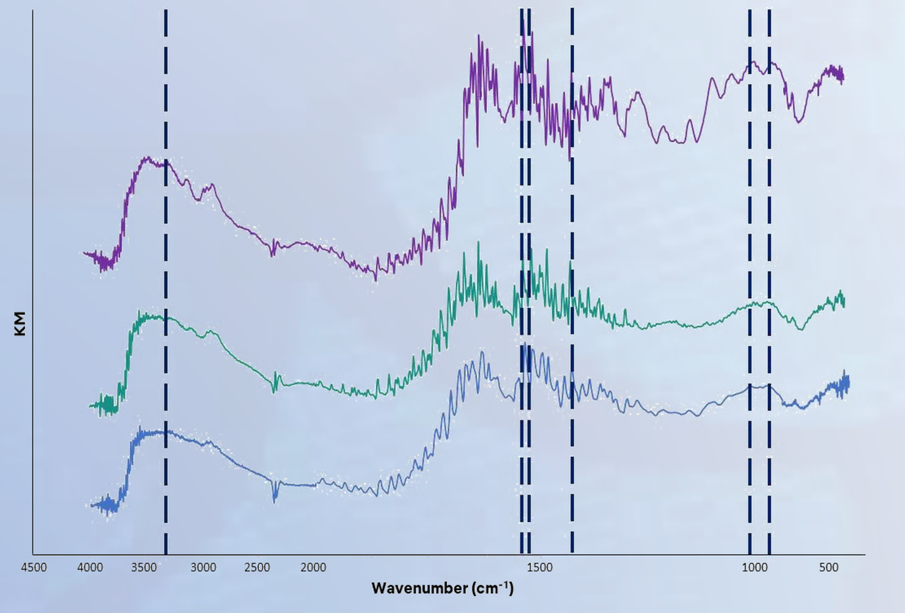
EXTRACTION THROUGH GREEN CHEMISTRY



4.2 CHARACTERIZATION

PERCENT YIELD 11.98% Bangus 16.93% Tilapia

FTIR SPECTRA



Standard chitin **Tilapia chitin** **Bangus chitin**

–NH2 and –OH stretching stretching of the amide I, amide II, and amide III, followed by the twin ether peaks are found in all chitin samples

DEGREE OF DEACETYLATION
24.83% Standard
22.01% Bangus
24.92% Tilapia

MOISTURE CONTENT
6.49% Standard
6.33% Bangus
6.64% Tilapia

MORPHOLOGY SEM images at **1500x magnification.**

Standard chitin Tilapia chitin Bangus chitin

5. CONCLUSION

In this research study, it is concluded that to ensure the highest chitin yield in terms of mass loss:

1. For demineralization, the optimal scale to acid ratio (gram raw powder:mL 1.14 M lactic acid) of bangus scales is 1:10, while the ratio for tilapia scales is 1:14., while for deproteinization, the optimal %bromelain for bangus scales is 20% (80% water), while for tilapia scales is 10% (90% water).

2. Based on the results following the optimized conditions, the highest obtained chitin yield in the reaction was 11.98% for bangus and 16.93% for tilapia.

3. The product obtained from the biological extraction was characterized together with a chitin standard through determining its functional groups, degree of deacetylation, moisture content and morphology. The characteristics of the product matches that of chitin standard, and thus was verified to be chitin.

6. REFERENCES

1. Cadano J. R., et al. A comparative study on the raw chitin and chitosan yields of common bio-waste from Philippine seafood. Environmental Science & Pollution Research. 2021, 28(10).; 2. El Knidri H. et al., Extraction, chemical modification and characterization of chitin and chitosan. International journal of biological macromolecules. 2018, 120:1181-9.; 3. Kumar P. S, et al. Conversion of waste plastics into low-emissive hydrocarbon fuels through catalytic depolymerization in a new laboratory scale batch reactor. International Journal of Energy and Environmental Engineering. 2017, 8(2):167-73.; 4. Ameh A. O, et al. Lactic acid demineralization of shrimp shell and chitosan synthesis. Leonardo Journal of Sciences. 2015, 26(26):57-66.; 5. Tang W. J, et al. Chitin is endogenously produced in vertebrates. Current Biology. 2015, 25(7):897-900.; 6. Campbell, M, et al. Biochemistry, Ninth Edition.; Cengage Learning, 2018.; 7. Sedaghat, F., et al. Bioconversion of shrimp waste Penaeus merguiensis using lactic acid fermentation: An alternative procedure for chemical extraction of chitin and chitosan. International journal of biological macromolecules. 2017, 104, 883-888.; 8. Zhang, H. et al. Production of chitin from shrimp shell powders using Serratia marcescens B742 and Lactobacillus plantarum ATCC 8014 successive two-step fermentation. Carbohydrate research. 2012, 362, 13-20.