



**PECTINASE PRODUCTION BY *Aspergillus niger* USING PECTIN FROM
PINEAPPLE PEELS AND ITS APPLICATION IN COCONUT OIL
EXTRACTION**

BY

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(16PCQ01449)

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Certification

This is to certify that **LAWAL, Beloved John**, a student of the Department of Biological Sciences (Microbiology Unit), Covenant University, Ota, Ogun State with matriculation number 16PCQ01449 has successfully completed the requirements of this research work supervised by Prof. A. A Ajayi and submitted to the Department of Biological Sciences, College of Science and Technology, Covenant University, Ota, Ogun State.

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Declaration

I hereby declare that I, LAWAL, BELOVED JOHN, is the sole author of this research work and that it has not been presented by previous application for award of Masters' in Science Degree. This project is based on my original study and the views of other researchers have been duly expressed and acknowledged. I hereby authorize Covenant University to lend it to other institutions or individuals for the purpose of their research work.

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LAWAL, Beloved John

MAY, 2018

Dedication

This work is dedicated to the glory of the Almighty God who in His infinite mercies and grace has kept me thus far. He is my all sufficiency, ever dependable, ever reliable creator.

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Abstract

Pectinases are a group of enzymes that hydrolyze pectic substances. This research is designed to produce pectinase from *A. niger* using laboratory produced pectin and to apply the pectinase produced to the extraction of oil from coconut. *A. niger* was isolated from five days old 'eba'. The isolate was identified by morphological characteristics. The identified isolate was inoculated into basal salt medium and pectinase was produced by submerged fermentation over a seven-day period at a 24h interval. The extracellular pectinase was partially purified using activated charcoal and characterized using such parameters as effect of temperature, effect of time of heating, effect of substrate concentration and effect of metal ions. Then, the crude and partially purified were applied to the extraction of oil from coconut. Process optimization was done with central composite design using Response surface methodology (RSM). The highest pectinase activity was obtained on the fifth day of incubation. Optimum conditions for temperature, pH and substrate concentration were ascertained at 40°C, 5 and 2 % respectively for pectinase produced by *A. niger*. The enzyme lost all its activity within 30min of heating at 90°C and metal ion (Mg^{2+}) stimulated the activity. This study revealed the production of pectinase from *Aspergillus niger*, optimized the process for industrial production of

the enzyme and revealed its effectiveness for extraction of oil.

Chapter 1

1.0. Introduction

Pineapple (*Ananas comosus*) fruits have been part of human eating routine for a very long time because of its wholesome and restorative qualities. Pineapple fruits can be utilized for generation of juices, concentrates, jams, salads, yoghurts, desserts etc. thereby creating loads of peels. This pineapple peels can be considered as squanders and lead to pollution in the environment (Bartholomew et al., 2003). This waste could one way or another be developed into pectin generation which is utilized as substrate for pectinase production. Pectin are the polysaccharides that are complex which exist in plant's center lamella (Marshall and Chow, 2007). Pectinase are heterogeneous set of enzymes which have effect on materials that contain pectin and leads it to break down into "galacturonates" (Oumer and Abate, 2017). They are grouped in view of the substrates they hydrolyse, their system of activity and kind of cleavage. Pectinases are characterized into: Polygalacturonases (PG), Polymethylgalacturonases (PMG), Pectin Methyl Esterases (PME) or Pectinesterases, Pectate Lyases (PGL) and Pectin Lyases (PL) (Amande and Adebayo-tayo, 2012, Pedrolli *et al.*, 2009). Several microorganisms such as bacteria, yeast and fungi have been employed for producing pectinase (Chellegati *et al.*, 2002). Be that as it may, the genera that has been most often revealed for producing pectinase include: *Bacillus*, *Erwinia*, *Kluveromyces*, *Saccharomyces*,