



**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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Table of contents

Certification	ii
Declaration	iii
Dedication	iv
Acknowledgements	v
Table of contents	vii
List of tables	xi
Abstract	xiv
Chapter 1	1
1.0. Introduction	1
1.1. Statement of problem	2
1.2. Justification for study	2
1.3 Research Aim	3
1.4 Research Objectives	3
Chapter Two	4
2.0 Literature Review	4
2.1 Pineapple	4

<u>2.2 Cell wall of the Plant</u>	8
<u>2.3 The Middle Lamella of the Fruit Cell</u>	8
<u>2.4 Pectic Materials(Substances)</u>	8
<u>2.4.1 Classification of Pectic Substances</u>	13
<u>2.5 Pectin</u>	13
<u>2.6 Part that Microorganisms play in Production of Pectinase</u>	17
<u>2.7 Microbial Enzymes</u>	18
<u>2.8 Pectins and Pectinases</u>	20
<u>2.9 Microbial Pectinases Biotechnological Applications</u>	21
<u>2.9.1 Enzymatic Clarification</u>	21
<u>2.9.1.1 Effect of Enzymatic treatment on Total Soluble Solids (TSS) of juice</u>	22
<u>2.9.1.2 Effect of Enzymatic treatment on Viscosity of juice</u>	22
<u>2.9.1.3 Effect of Enzymatic Treatment on Ascorbic Acid Content of Juice</u>	23
<u>2.9.1.4 Effect of Enzymatic Treatment on Turbidity of Juice</u>	23
<u>2.9.1.5 Effect of Enzymatic Treatment on Titrable Acidity of Juice</u>	24
<u>2.9.1.6 Effect of Enzymatic Treatment on Anthocyanin Content of Juice</u>	24
<u>2.9.1.7 Effect of Enzymatic Treatment on Total Phenols of Juice</u>	24
<u>2.9.2 Fermentation of Tea and Coffee</u>	25
<u>2.9.3 Processing of Textile and Fibers in Cotton Bioscouring</u>	25
<u>2.9.4 Bast Fibers of Plant Degumming</u>	25
<u>2.9.5 Waste Water Treatment</u>	25
<u>2.9.6 Paper Manufacture</u>	26
<u>2.9.7 Feed for Animals</u>	26
<u>2.9.8 Viruses of Plants Purification</u>	26

<u>2.9.9 Enhancement of Red Wines Stability and Chromaticity</u>	26
<u>2.10 Conditions Required for Fermentation</u>	27
<u>2.11 Types of Fermentation</u>	28
<u>2.12 Microorganisms Commonly Used in Submerged and Solid-State Fermentation for Pectinases Production</u>	29
<u>2.13 Coconut</u>	30
<u>Chapter Three</u>	32
<u>Materials and Methods</u>	32
<u>3.0 Materials</u>	32
<u>3.0.1 Sterilization of Materials</u>	33
<u>3.1 Methodology</u>	33
<u>3.1.1 Collection and preparation of Pineapple peels</u>	33
<u>3.1.2 Extraction of Pectin</u>	33
<u>3.1.3 Isolation and identification of fungi</u>	33
<u>3.1.4 Chemical analysis of the substrate</u>	34
<u>3.1.5 Fermentation/Enzyme Production</u>	34
<u>3.1.6 Pectinase assay</u>	35
<u>3.1.7 Partial Purification of Crude Pectinase with Activated Charcoal</u>	35
<u>3.1.8 Determination of protein</u>	35
<u>3.1.9 Characterization of Enzymes</u>	35
<u>3.1.9.1 Effect of pH on Pectinase Activity</u>	36
<u>3.1.9.2 Effect of Temperature on Pectinase Activity</u>	36
<u>3.1.10 Collection of coconut</u>	37
<u>3.1.11 Enzyme-assisted oil extraction</u>	37

<u>3.1.12 Experimental Design for Optimization of pectinase production</u>	38
<u>Chapter 4</u>	48
<u>Results</u>	48
<u>4.1 Percentage Extraction Yield of Pineapple Pectin</u>	48
<u>4.2 Analysis of the substrate</u>	48
<u>4.3 Identification of fungal isolate</u>	48
<u>4.4 Pectinase Activity from submerged Fermentation by <i>Aspergillus niger</i></u>	48
<u>4.5 Substrate Concentration effect on Pectinase Activity</u>	48
<u>4.6 Heating Time effect on Pectinase Activity</u>	48
<u>4.7 Temperature effect on Pectinase Activity</u>	49
<u>4.8 pH Effect on Activity of Pectinase</u>	49
<u>4.9 Metal ions effect on Pectinase Activity</u>	49
<u>Chapter Five</u>	61
<u>5.0 Discussion</u>	61
<u>5.1 Contributions to Knowledge</u>	65
<u>5.2 Conclusion</u>	65
<u>5.3 Recommendations</u>	65
<u>References</u>	67
<u>Appendix 1</u>	89
<u>Appendix 2</u>	90
<u>Appendix 3</u>	92

List of tables

Table 1: Nutritional Value per 100g of Pineapple Fruits	7
Table 2: Composition of pectic substances in different fruits and vegetables	11
TABLE 3: Comparison of Solid State and Submerged Fermentation Error! Bookmark not defined.	
TABLE 4: Morphology of <i>Aspergillus niger</i>	50

<u>TABLE 5: Purification table of pectinase produced by <i>A. niger</i> using laboratory pectin as substrate</u>	52
<u>Table 6: Effect of metal ions on pectinase produced by <i>A. niger</i> using laboratory pectin as substrate</u>	57
<u>Table 7: Levels of the Four Independent Variables (Factors) used in RSM</u>	40
<u>Table 8: Central Composite Rotatable Design of the Variables with Enzyme Activity as Response</u>	42
<u>Table 9: Analysis of Variance (ANOVA) for Response Surface Second-Order Model</u>	44
<u>Table 10: Estimated Regression Coefficients for the Second-Order Model</u>	45
<u>Table 11: Statistical Analysis of Pectinase production</u>	47

LIST OF FIGURES

<u>Figure. 1: Parts of a pineapple fruit</u>	6
<u>Fig.2: Structure of the Plant Cell Wall</u>	9
<u>Fig. 3: Primary Structure of Pectic Substances</u>	12
<u>Fig. 4: Structure of Galacturonic Acid</u>	15
<u>Fig. 5: Activity of pectinase produced by <i>A. niger</i> using laboratory pectin as substrate</u>	51
<u>Fig. 6: Effect of substrate concentration on pectinase produced by <i>A. niger</i> using laboratory pectin as substrate</u>	53
<u>Fig. 7: Effect of heat (90°C) on pectinase produced by <i>A. niger</i> using laboratory pectin as substrate</u>	54
<u>Fig. 8: Effect of temperature on pectinase produced by <i>A. niger</i> using laboratory pectin as substrate</u>	55
<u>Fig 9: Effect of pH on pectinase produced by <i>A. niger</i> using laboratory pectin as substrate</u> ..	56
<u>Fig. 10: Oil Extraction Yield</u>	58
<u>Fig. 11 (a) Effect of temperature and pH on the production of pectinase keeping substrate</u> ..	59

LIST OF PLATES

Plate 1: *Aspergillus niger* from 5 days old 'eba'95

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*,