PRODUCTION OF SINGLE CELL PROTEIN FROM PINEAPPLE AND WATERMELON WASTE USING *Saccharomyces cerevisiae*

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(19PCQ02044)

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE (M.Sc.) DEGREE IN MICROBIOLOGY IN THE DEPARTMENT OF BIOLOGICAL SCIENCES, COLLEGE OF SCIENCE AND TECHNOLOGY, COVENANT UNIVERSITY

OCTOBER, 2021

ACCEPTANCE

This is to attest that this dissertation is accepted in partial fulfillment of the requirements for the award of the degree of Master of Science in Microbiology in the Department of Biological Sciences, College of Science and Technology, Covenant University, Ota, Nigeria.

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(Secretary, School of Postgraduate Studies) Signature and Date

Prof. Akan B. Williams …….

(Dean, School of Postgraduate Studies) Signature and Date

DECLARATION

I, SALAMI, ABIMBOLA OLUWADARASIMI (19PCQ02044) declare that this research was carried out by me under the supervision of Prof. Obinna C. Nwinyi of the Department of Biological Sciences, College of Science and Technology, Covenant University, Ota, Nigeria. I attest that the dissertation has not been presented either wholly or partially for the award of any degree elsewhere. All sources of data and scholarly information used in this dissertation are duly acknowledged.

SALAMI, ABIMBOLA OLUWADARASIMI Signature and Date

CERTIFICATION

We certify that this dissertation titled **"PRODUCTION OF SINGLE CELL PROTEIN FROM PINEAPPLE AND WATERMELON WASTE USING *Saccharomyces cerevisiae*"** is an original research work carried out by **SALAMI, ABIMBOLA OLUWADARASIMI (19PCQ02044)** in the Department of Biological Sciences, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria under the supervision of Prof. Obinna C. Nwinyi. We have examined and found this work acceptable as part of the requirements for the award of Master of Science in Microbiology.

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DEDICATION

I dedicate this research to God Almighty, my Creator, and strong pillar, source of inspiration, strength, wisdom, knowledge, and understanding.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

APPENDICES

LIST OF ABBREVIATIONS

BLAST	Basic Local Algorithm Search Tool
BSA	Bovine Serum Albumin
CDW	Cell Dry Weight
FHM	Fruit Hydrolysate Media
GM	Glucose Supplemented Media
GNF	Glucose-Nitrogen Supplemented Media
ITS	Internal Transcribed Spacer
MF	Molasses Supplemented Fruit media
NCBI	National Center for Biotechnology Information
OD	Optical Density
PCR	Polymerase Chain Reaction
PDA	Potato Dextrose Agar
rDNA	ribosomal Deoxyribonucleic acid
SCP	Single-cell Protein
SF	Supplemented Fruit Media

ABSTRACT

The fast growing population of the world has led to an increased demand for protein rich food. The conversion of fruit wastes into single-cell protein is an alternative solution to the worldwide protein deficiency and environmental pollution concerns. In this study, watermelon and pineapple fruit peels were used to produce single cell protein by submerged fermentation. The organism used for the single cell production was isolated from Palm wine. The organism was characterized via standard microbiological methods – morphological, biochemical and molecular characterization. For the molecular characterization the internal transcribed spaces ITS 1and ITS4 genes were targeted and sequenced using Sanger Sequencing method. In addition, the isolate evolutionary relatedness was performed on the basis of rDNA comparison of the obtained data sequence with known sequences in the GenBank. Five different hydrolysate media were compounded and used to determine the growth profile of the isolate and single cell protein production. The formulates from the fruits include: FHM, GH, GHM, GNF and MF. The rDNA sequence comparison identified the organism as *Saccharomyces cerevisiae* with accession number OK172582 with 99.62 % homology to the type strain of *Saccharomyces cerevisiae* strain YBA 08. The pineapple and watermelon fruit hydrolysate media supplemented with molasses recorded high concentrations of total protein (0.53-0.66 mg/mL) respectively on the 7th day of fermentation, as compared to that of the fruit hydrolysate media without supplementation which produced 0.01-0.06 mg/mL of protein respectively. Similarly, fruit hydrolysate media supplemented with glucose and nitrogen recorded a high content of protein (0.24-0.52mg/mL) while fruit hydrolysate media supplemented with glucose produced (0.07-0.20mg/mL) of protein and the supplemented fruit hydrolysate media produced (0.12-0.17mg/mL) protein. It was observed that supplementation with molasses as a carbon source greatly increased SCP production in both fruit combinations. This suggest that microbial growth on fruit peels can be best improved by addition of molasses as a nutrient supplement rather than just the fruit peels. The findings in this study indicated that pineapple and watermelon peels could serve as a good substrate for SCP production.

Keywords: Fermentation, Pineapple, *Saccharomyces cerevisiae,* Single Cell Protein, Watermelon.