

**CELLULOSE DEGRADATION BY TWO SPECIES OF  
BACTERIA FOUND IN THE GUT OF *ZOOTERMOPSIS*  
*ANGUSTICOLLIS***

**BY  
UCHE DORIS AMARACHUKWU  
(MB/2008/392)**

**DEPARTMENT OF MICROBIOLOGY AND BIOTECHNOLOGY  
FACULTY OF NATURAL SCIENCE  
CARITAS UNIVERSITY, AMORJI-NIKE, ENUGU.**

**AUGUST, 2012**

**TITLE PAGE**

**CELLULOSE DEGRADATION BY TWO SPECIES OF BACTERIA  
FOUND IN THE GUT OF *ZOOTERMOPSIS ANGUSTICOLLIS***

**BY  
UCHE DORIS AMARACHUKWU  
(MB/2008/392)**

**A RESEARCH PROJECT (MCB 429) SUBMITTED IN PARTIAL  
FULFILLMENT FOR THE AWARD OF BACHELOR OF SCIENCE  
(B.SC.) DEGREE IN MICROBIOLOGY AND BIOTECHNOLOGY**

**TO**

**DEPARTMENT OF MICROBIOLOGY AND BIOTECHNOLOGY  
FACULTY OF NATURAL SCIENCES  
CARITAS UNIVERSITY, AMORJI-NIKE, ENUGU.**

**SUPERVISOR: MISS OKWUOBI P.N**

**AUGUST, 2012**

## CERTIFICATION PAGE

I certify that this research project titled “ Cellulose degradation by two species of bacteria found in the gut of *Zootermopsis Angusticollis*” was carried out by Uche Doris Amarachukwu (MB/2008/392) in the department Microbiology and Biotechnology in the faculty of Natural science, Caritas University Amorji-Nike, Enugu. The department recognizes that Uche Doris Amarachukwu (MB/2008/392) bears full responsibility for this work..

Name: Uche Doris Amarachukwu

Signature: .....

(Student)

Date .....

Name: Miss Okwuobi P.N

Signature: .....

(Supervisor)

Date: .....

Name: .....

Signature: .....

(External Supervisor)

Date.....

Name: Dr. Nmemma E.E

Signature: .....

(HOD)

Date.....

## **ACKNOWLEDGMENT**

I wish to express my sincere and immense gratitude to all who have contributed in one way or the other to the successful completion of this project.

Firstly, my sincere gratitude goes to my project supervisor, Miss. Patricia Okwuobi, my project co-ordinator Mrs. Ezeme .A, and the dean of my faculty Prof. Ibemesi who through thier able co-ordination, understanding and useful suggestion made this project successful.

My sincere gratitude and thanks also goes to my beloved parents Mr. R A Uche and Mrs. Esther U. Uche, my brothers darlington, Collins and kennedy, my one and only sister Juliet-Jacqueline for their spiritual, moral and financial support throughout my academic pursuit especially in this research work.

I want to specially appreciate my aunty Rev. SIS Jacqueline Anujuru, Mis Ruphina Anujuru, Miss Patricia Anujuru, aunty Vicky Uchendu, Kaosisochukwu and Chizitere whose prayers, moral and financial support helped me in this research work I pray that almighty God reward you abundantly.

Also to my friends who have helped me in their little efforts, advice and suggestion especially, Ugochi, Chinwe, Chidimma, Eberechukwu, Chiamaka, Sandra, Ukamaka, my roommates, my departmentals and all my well wishers. I love you all and may Almighty God bless you all.

## **DEDICATION**

This research work is dedicated to Almighty God who my strength and my fortress and to my beloved mother Mrs. Esther U. Uche for her immense support both financially, morally and otherwise.

## TABLE OF CONTENT

Title page	-	-	-	-	-	-	-	-	-	i
Certification page	-	-	-	-	-	-	-	-	-	ii
Acknowledgment	-	-	-	-	-	-	-	-	-	iii
Dedication	-	-	-	-	-	-	-	-	-	iv
Table of content	-	-	-	-	-	-	-	-	-	v
List of tables	-	-	-	-	-	-	-	-	-	vi
List of figures	-	-	-	-	-	-	-	-	-	vii
Abstract	-	-	-	-	-	-	-	-	-	viii

### CHAPTER ONE:

<b>1.0 INTRODUCTION-</b>	-	-	-	-	-	-	-	-	-	<b>1-7</b>
Cellulose	-	-	-	-	-	-	-	-	-	1
Microbial Celluloses	-	-	-	-	-	-	-	-	-	2
1.1 Aims and objectives	-	-	-	-	-	-	-	-	-	7

### CHAPTER TWO:

<b>2.0 LITERATURE REVIEW-</b>	-	-	-	-	-	-	-	-	-	<b>8-15</b>
2.1 Background and History	-	-	-	-	-	-	-	-	-	8
2.2 Diversity of termites	-	-	-	-	-	-	-	-	-	11
2.3 Diversity of Microbial symbiosis in termites	-	-	-	-	-	-	-	-	-	12
2.4 Function of symbiosis useful for industrial application	-	-	-	-	-	-	-	-	-	14
2.5 Function of termites useful for industrial application	-	-	-	-	-	-	-	-	-	15

## **CHAPTER THREE:**

### **3.0 MATERIALS AND METHODS- - - - - 16-**

3.1	Sample Collection	-	-	-	-	-	-	16
3.2	Dissections	-	-	-	-	-	-	16
3.3	Media used	-	-	-	-	-	-	16
3.4	Sterilization and aseptic methods employed	-	-	-	-	-	-	17
3.5	Pure cultures	-	-	-	-	-	-	17
3.6	Isolation and screening of cellulose degrading bacteria	-	-	-	-	-	-	18
3.7	Identification of isolates using biochemical tests	-	-	-	-	-	-	18
3.7.1	Gram staining	-	-	-	-	-	-	19
3.7.2	Oxidase test	-	-	-	-	-	-	19
3.7.3	Catalase test	-	-	-	-	-	-	19
3.7.4	Sugar fermentation test	-	-	-	-	-	-	20
3.7.5	Indole test	-	-	-	-	-	-	21
3.7.6	Methyl Red	-	-	-	-	-	-	21
3.7.7	Voges-Proskauer Test	-	-	-	-	-	-	21
3.8	Assay of cellulose producing microorganisms	-	-	-	-	-	-	22

## **CHAPTER FOUR**

4.0	Results	-	-	-	-	-	-	23-27
-----	---------	---	---	---	---	---	---	-------

## **CHAPTER FIVE- - - - - -28-40**

5.0	Discussion	-	-	-	-	-	-	-28
5.1	Conclusion	-	-	-	-	-	-	-28
5.2	Recommendation	-	-	-	-	-	-	-29
	References	-	-	-	-	-	-	-30

Appendix 1 -	-	-	-	-	-	-	-	-	-31
Appendix 2-	-	-	-	-	-	-	-	-	-40



## **LIST OF TABLES**

Table 1	Morphological characterization of gut isolate	-	-	24
Table 2	Biochemical characterization of gut isolates	-	-	25
Table 3	Physical characterization of CDB5 and CDB9	-	-	27

## **LIST OF FIGURES**

- Figure 1. Line Drawing of Cellulose
- Figure 2. Hydrogen Bonding Within Cellulose

## ABSTRACT

This study investigates the ability of bacteria species to degrade cellulose as their sole carbon source. The microorganisms were isolated from the macerated gut of *Zootermopsis Angusticollis* (A damp wood eating termite) and identified based on their morphological, biochemical characteristics and gram staining. They were screened for their ability to degrade cellulose using cellulose congo-red agar as indicator. The result showed that these two isolates(CDB5andCDB9)which is *Bacillus Spp* and *E coli* demonstrated the ability to digest cellulose as a sole carbon source which establish the capabilities of the cellulose systems and show the potential industrial value of the two isolates.