

**CONVERSION OF CELLULOSE TO GLUCOSE BY MICROBES
ISOLATED FROM HIGHER TERMITES**



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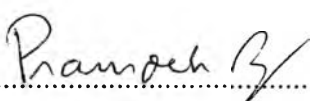
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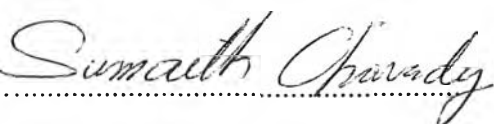
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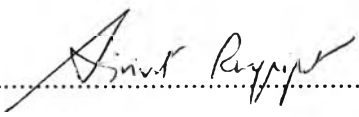

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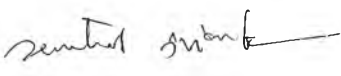
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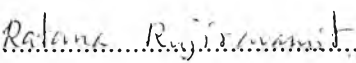

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ABSTRACT

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Chalinee Worasamutprakarn: Conversion of Cellulose to Glucose by Microbes Isolated from Higher Termites

Thesis Advisors: Assoc. Prof. Pramoch Rangsunvigit, Assoc. Prof. Sumaeth Chavadej, Asst. Prof. Thammanoon Sreethawong, and Assoc. Prof. Sirirat Rengpipat, 64 pp.

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The aim of this research was to convert cellulose to glucose by using bacteria isolated from higher termites. Due to the cellulose structure comprising several units of cellulose fibrils with high crystallinity, a pretreatment step is required in order to reduce the crystallinity and increase the accessibility of cellulose. An ionic liquid, 1-butyl-3-methylimidazolium chloride, or [BMIM]Cl, was used in the pretreatment step. The effects of cellulose-to-[BMIM]Cl ratio, temperature, and time for the dissolution of cellulose were studied. The optimum conditions of the pretreatment step were found to be a cellulose-to-[BMIM]Cl ratio of 5:100, a temperature of 100 °C, and a treatment time of 4 h. After that, the enzymatic hydrolysis of the pretreated cellulose using cellulases derived from bacteria isolated from higher termites, *Microcerotermes* sp., was studied. The maximum amount of glucose production obtained from the hydrolysis step at 37 °C was 0.59 g/L.

บทคัดย่อ

ชาลินี วรสมุทรปราการ: การผลิตกลูโคสจากเซลลูโลสโดยใช้จุลินทรีย์จากปลวกชั้นสูง (Conversion of Cellulose to Glucose by Microbes Isolated from Higher Termites) อ.ที่ปรึกษา: รศ. ดร. ปราโมช รังสรรค์วิจิตร รศ. ดร. สุเมธ ชวเดช ผศ. ดร. ธรรมบุญ ศรีทะวงศ์ และ รศ. ดร. ศิริรัตน์ เร่งพิพัฒน์ 64 หน้า

เป้าหมายของงานวิจัยนี้คือการเปลี่ยนเซลลูโลสให้กลายเป็นน้ำตาลกลูโคสโดยใช้จุลินทรีย์จากปลวกชั้นสูง เนื่องจากโครงสร้างเซลลูโลสประกอบด้วยเส้นใยเซลลูโลสจำนวนมากที่มีโครงสร้างการจัดเรียงตัวหนาแน่น จึงจำเป็นต้องใช้ขั้นตอนการเตรียมเบื้องต้นในการลดการจัดเรียงตัวที่หนาแน่นของโครงสร้างและทำให้เอนไซม์เซลลูเลสเข้าสู่พื้นผิวภายในของเซลลูโลสมากขึ้น ซึ่งในขั้นตอนการเตรียมเบื้องต้นนี้ทำโดยใช้ Ionic Liquid ชนิด 1-Butyl-3-methylimidazolium chloride หรือ [BMIM]Cl ตัวแปรที่ศึกษาได้แก่ สัดส่วนเซลลูโลสต่อ [BMIM]Cl อุณหภูมิ และเวลาในการละลายเซลลูโลส จากการทดลองพบว่าสภาวะที่เหมาะสมของขั้นตอนการเตรียมเบื้องต้นคือ สัดส่วนเซลลูโลสต่อ [BMIM]Cl ที่ 5:100 อุณหภูมิ 100 องศาเซลเซียส และใช้เวลา 4 ชั่วโมง จากนั้นทำการศึกษากระบวนการเปลี่ยนเซลลูโลสเป็นน้ำตาลกลูโคสโดยใช้เอนไซม์เซลลูเลสที่สร้างขึ้นโดยแบคทีเรียจากปลวกชั้นสูง ผลการศึกษาพบว่าปริมาณน้ำตาลกลูโคสสูงสุดที่ได้รับจากกระบวนการดังกล่าวอยู่ที่ 0.59 กรัมต่อลิตร ที่อุณหภูมิ 37 องศาเซลเซียส

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TABLE OF CONTENTS

	PAGE
Title Page	i
Abstract (in English)	iii
Abstract (in Thai)	iv
Acknowledgements	v
Table of Contents	vi
List of Tables	viii
List of Figures	ix
CHAPTER	
I INTRODUCTION	1
II LITERATURE REVIEW	3
III EXPERIMENTAL	20
3.1 Materials	20
3.1.1 Chemicals	20
3.1.2 Test Kits	20
3.2 Equipment	21
3.3 Methodology	22
3.3.1 Cellulose Pretreatment	22
3.3.2 Design of a Hydrolysis Reactor	23
3.3.3 Preparation of Bacteria Cells for Enzymatic Hydrolysis	26
3.3.4 Reactor Start-up and Operating Condition	27
3.3.5 Determination of Glucose and Cellulose Conversion	27
IV RESULTS AND DISCUSSION	28
4.1 Cellulose Pretreatment	28
4.2 Enzymatic Hydrolysis	30

CHAPTER	PAGE
4.2.1 Effect of Strains on Glucose Production	30
4.2.2 Effect of Mixed Strains on Glucose Production	33
4.2.3 Effect of Bacteria Concentration on Glucose Production	35
4.2.4 Bacteria Concentration and Glucose Production vs Time	35
4.2.5 Cellulose Concentration and Glucose Production vs Time	40
4.2.6 Effect of Cellulose Structure on the Glucose Production	42
V CONCLUSIONS AND RECOMMENDATIONS	44
5.1 Conclusions	44
5.2 Recommendations	45
REFERENCES	46
APPENDICES	48
CURRICULUM VITAE	61

LIST OF TABLES

TABLE		PAGE
2.1	Advantages and disadvantages of pretreatment	6
2.2	Solubility of cellulose in some ionic liquids	7
2.3	Melting points of selected chlorides	8
2.4	Preliminary identification of strain A 002, M 015, and F 018 by microbiological methods (Taechapoempol, 2009)	16
4.1	Crystallinity of Whatman filter paper	42

LIST OF FIGURES

FIGURE		PAGE
2.1	Schematic representation of a cellulose chain.	3
2.2	Molecule structure of 1-butyl-3-methylimidazolium chloride, [BMIM]Cl.	8
2.3	SEM micrographs of the initial dissolving pulp (left) and after dissolution in [BMIM]Cl and regeneration into water (right).	9
2.4	Thermal decomposition profiles of (i) regenerated cellulose and (ii) original dissolving pulp. Samples were heated in platinum sample containers under a nitrogen atmosphere at 10°C/min.	10
2.5	XRD patterns for IL-treated and untreated-cellulose. Untreated cellulose (A), exhibited a significantly greater degree of crystallinity than that of regenerated samples (B–E). Cellulose samples were incubated in [BMIM]Cl at 120°C for 30 min and precipitated with deionized water. Samples B–E correspond to 30, 15, 10, and 5wt%.	11
2.6	Cellulose samples of 5% (□), 10% (○), 15% (Δ), and 30% (∇) were incubated for 30 min in [BMIM]Cl at 120°C, and precipitated with deionized water. Hydrolysis rates of IL incubated samples by <i>T. reesei</i> are compared with that of untreated Avicel (▲). (A) Total soluble sugars (measured using a DNSA assay) and (B) Percent cellulose conversion to glucose.	12

FIGURE		PAGE
2.7	Selection of solvents for pretreatment of wheat straw. Pretreatment condition: the wheat straw samples were incubated for 1 h at 100 °C and regenerated using the anti-solvents water. Hydrolysis condition: regenerated and water-treated wheat straws (10 mg/mL) were hydrolyzed using a cellulase activity of 30 FPU/g substrate at 50 °C and pH 4.8.	13
2.8	Effect of anti-solvent on the regeneration of wheat straw. Pretreatment condition: the wheat straw samples were incubated for 30 min at 130 °C and regenerated using the anti-solvents water, methanol, and ethanol, respectively. Hydrolysis condition: regenerated wheat straws (10 mg/mL) were hydrolyzed for 12 h using a cellulase activity of 30 FPU/g substrate at 50 °C and pH 4.8.	14
2.9	Mechanistic scheme of enzymatic cellulose hydrolysis by <i>Trichoderma</i> , non-complexed cellulase system.	16
2.10	Comparison of specific endoglucanase activity between strain A 002, M 015, and F 018 at 37°C, and pH 7.2 for 24 h.	18
2.14	Comparison of specific Fpase activity between strain A 002, M 015, and F 018 at 37°C and pH 7.2 for 24 h.	18
2.15	Comparison of specific β -glucosidase activity between strain A 002, M 015, and F 018 at 37°C for 24 h.	19

FIGURE	PAGE
3.1 Schematic illustrating glucose production process.	22
3.2 Schematic of a hydrolysis system.	23
3.3 Diagram of a hydrolysis reactor a) glass reactor, b) hose, c) air spreader.	24
3.4 Hydrolysis reactor.	26
4.1 Crystallinity of cellulose before and after IL pretreatment for 4 h (Cellulose-to-[BMIM]Cl ratio of 5:100, 100°C).	28
4.2 Decrease in the crystallinity of cellulose treated with IL at difference temperatures at the 5:100 cellulose-to-[BMIM]Cl ratio.	39
4.3 Decrease in the crystallinity of cellulose treated with IL at difference temperatures at the 7:100 cellulose-to-[BMIM]Cl ratio.	29
4.4 Glucose evolution from the enzymatic hydrolysis using strain A 002.	31
4.5 Glucose evolution from the enzymatic hydrolysis using strain F 018.	31
4.6 Glucose evolution from the enzymatic hydrolysis using strain M 015.	32
4.7 Glucose evolution from the enzymatic hydrolysis using mixed of strain A 002 and M 015.	33
4.8 Glucose evolution from the enzymatic hydrolysis of the pretreated cellulose using mixed strain of A 002 and M 015, strain A 002, and strain M 015.	33
4.9 Glucose evolution from the enzymatic hydrolysis of the pretreated cellulose using mixed strain of A 002 and M 015, and strain M 015.	34

FIGURE		PAGE
4.10	Glucose evolution from the enzymatic hydrolysis of the pretreated cellulose using strain M 015 with different concentration of bacteria.	35
4.11	Glucose evolution and bacteria growth from the enzymatic hydrolysis of the untreated cellulose using strain A 002.	36
4.12	Glucose evolution and bacteria growth from the enzymatic hydrolysis of the pretreated cellulose using strain A 002.	36
4.13	Glucose evolution and bacteria growth from the enzymatic hydrolysis of the untreated cellulose using strain F 018.	37
4.14	Glucose evolution and bacteria growth from the enzymatic hydrolysis of the pretreated cellulose using strain F 018.	37
4.15	Glucose evolution and bacteria growth from the enzymatic hydrolysis of the untreated cellulose using strain M 015.	39
4.16	Glucose evolution and bacteria growth from the enzymatic hydrolysis of the pretreated cellulose using strain M 015.	39
4.17	Glucose evolution and pretreated cellulose concentration from the enzymatic hydrolysis using strain A 002.	40
4.18	Glucose evolution and pretreated cellulose concentration from the enzymatic hydrolysis using strain F 018.	41

FIGURE		PAGE
4.19	Glucose evolution and pretreated cellulose concentration from the enzymatic hydrolysis using strain M 015.	41
4.20	Glucose concentration from the enzymatic hydrolysis of the untreated cellulose using isolated strain A 002 at 9 h.	42