CONVERSION OF SUGARCANE BAGASSE TO SUGARS BY MICROBIAL HYDROLYSIS

Supitcha Visuttitewin

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By:	Ms. Supitcha Visuttitewin
Program:	Petrochemical Technology
Thesis Advisors:	Prof. Sumaeth Chavadej
	Assoc. Prof. Pramoch Rangsunvigit

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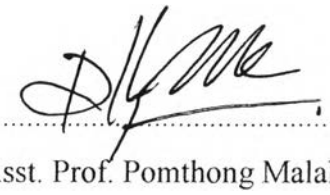

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(Asst. Prof. Pomthong Malakul)

Thesis Committee:

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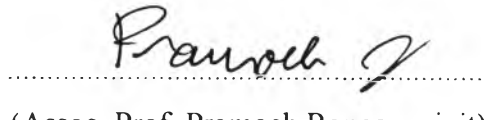

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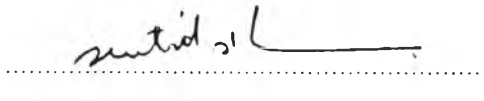

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ABSTRACT

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Sugarcane bagasse is one of the most abundant low-cost lignocellulosic materials in the world. It consists of 46.7% cellulose, 28.89% hemicellulose, and 13.83% lignin (dry basis). The cellulose and hemicellulose of sugarcane bagasse can be hydrolyzed by microbial hydrolysis into glucose and other fermentable sugars, which can be further served as feedstock in the fermentation process to produce bioethanol. The aim of this research was to investigate the possibility of using bagasse as a raw material to produce glucose by microbial hydrolysis using bacteria isolated from Thai higher termites, *Microceroterm sp.* The effects of particle sizes (40−60, 60−80, and > 80 mesh), and bacterial strains (A 002 and M 015) isolated from Thai higher termites on microbial hydrolysis were investigated at 37°C in order to determine optimum conditions for a maximum glucose concentration. From the results, the highest glucose concentration of 0.46 g/L was obtained by using strain A002 with > 80 mesh bagasse at 8 h. In order to compare glucose production, the > 80 mesh bagasse was hydrolyzed enzymatically using a commercial enzyme, which was cellulase produced from *Aspergillus niger*. The results revealed that the hydrolytic activities of both strains were found to be as high as that of commercial enzyme.

บทคัดย่อ

สุพิชชา วิสุทธิเทวินทร์ : การเปลี่ยนแปลงชานอ้อยไปเป็นน้ำตาลโดยการย่อยแบคทีเรีย (Conversion of Sugarcane Bagasse to Glucose by Microbial Hydrolysis) อ.ที่ปรึกษา: ศ. ดร. สุเมธ ชวเดช และ รศ. ดร. ปราโมช รังสรรค์วิจิตร 61 หน้า

ชานอ้อยเป็นผลผลิตพลอยได้ชนิดหนึ่งจากเกษตรกรรม องค์ประกอบของชานอ้อยนั้นประกอบไปด้วย เซลลูโลสร้อยละ 47 เฮมิเซลลูโลสร้อยละ 29 และลิกนินร้อยละ 14 เซลลูโลสและเฮมิเซลลูโลสในชานอ้อยนั้น สามารถเปลี่ยนไปเป็นน้ำตาลกลูโคสและน้ำตาลอื่นๆได้ โดยกระบวนการย่อยด้วยแบคทีเรียซึ่งน้ำตาลที่ผลิตได้นั้นสามารถใช้เป็นวัตถุดิบตั้งต้นในการผลิตเอทธานอล วัตถุประสงค์หลักของงานวิจัยนี้คือ การศึกษาความเป็นไปได้ของการใช้ชานอ้อย เพื่อเป็นวัตถุดิบตั้งต้น สำหรับกระบวนการย่อยด้วยเอนไซม์ โดยแบคทีเรียที่ได้จากปลวกชั้นสูง ตัวแปรที่ศึกษาในงานวิจัยนี้ประกอบไปด้วย ขนาดของอนุภาคของชานอ้อย (40-60, 60-80, และ 80 เมช) ปริมาณมอลสกัดในตัวกลางที่มีอาหารเลี้ยงเชื้อ (12 กรัมต่อลิตร 10 กรัมต่อลิตร 8 กรัมต่อลิตร และ 6 กรัมต่อลิตร) และสายพันธุ์ของแบคทีเรีย (สาพันธุ์ เอ 002 และ เอ็ม 015) การวิเคราะห์เชิงคุณภาพและปริมาณของน้ำตาลที่ได้นั้นถูกวิเคราะห์โดยเครื่อง HPLC (high performance liquid chromatography) ที่ใช้ตัวชี้วัดแบบ Refractive Detector จากการวิเคราะห์พบว่า ปริมาณน้ำตาลกลูโคสสูงสุดประมาณ 0.459 กรัมต่อลิตรที่ ชั่วโมงที่ 8 ได้มาจากการย่อยชานอ้อยขนาด 80 เมช ด้วยแบคทีเรียสายพันธุ์ เอ 002 โดยปริมาณของมอลสกัด 10กรัมต่อลิตรในตัวกลางที่มีอาหารเลี้ยงเชื้อและปริมาณของน้ำตาลกลูโคส ที่ได้จากการย่อยชานอ้อยขนาด 80 เมชด้วยแบคทีเรียที่แยกได้จากปลวกชั้นสูงถูกนำมาเปรียบเทียบกับปริมาณน้ำตาลกลูโคสที่ได้จากการย่อยชานอ้อยด้วยเอนไซม์เซลลูเลส จาก Aspergillus Niger จากการวิเคราะห์ค้นพบว่าแบคทีเรียจากปลวกชั้นสูงมีความสามารถในการย่อยชานอ้อยไปเป็นกลูโคสได้ดีเทียบเท่ากับการใช้เอนไซม์เซลลูเลส

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