

**MICROWAVE-ASSISTED PRETREATMENT
OF CORNCOBS FOR BUTANOL PRODUCTION**

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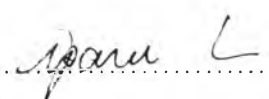
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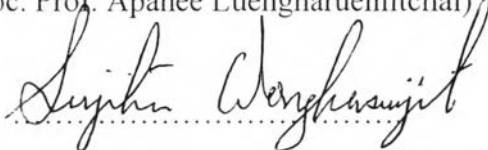
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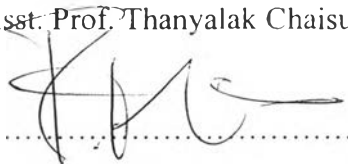

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ABSTRACT

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A two-stage pretreatment of corncobs using NaOH followed by H₂SO₄ combined with microwave radiation prior enzymatic hydrolysis has been examined. The optimum condition of second stage was obtained with response surface methodology (RSM) at a three-variable and five-level central composite design (CCD). A maximum concentration of glucose 48.58 g/l was obtained at the optimal condition of 2 % NaOH at 100 °C, 30 min, and SLR 67 for first stage and 1 % H₂SO₄ at 156 °C, 16 min, and SLR 106 for second stage of two-stage pretreatment. The result showed that SLR and temperature are the most significant factors on the glucose concentration. After that, the hydrolysate was used to produce Acetone-Butanol-Ethanol (ABE) by *Clostridium beijerinckii* TISTR11461. The overliming combined with diluted 4 times hydrolysate (D4O) technique gave the highest ABE yield of 0.41. It is suggested that the dilution and overliming process can reduce fermentation inhibitors, increase cell growth and improve ABE yield.

บทคัดย่อ

จิตภา มนะโส : การพรีทรีทเมนต์ซังข้าวโพดด้วยรังสีไมโครเวฟเพื่อใช้ในการผลิต บิวทานอล (Microwave-assisted pretreatment of corncobs for butanol production)

อ. ที่ปรึกษา : รศ.ดร. อาภาณี เหลืองนฤมิตชัย และ รศ.ดร. สุจิตรา วงศ์เกษมจิตต์ 69 หน้า

การพรีทรีทเมนต์ซังข้าวโพดเป็นกระบวนการที่สำคัญก่อนการย่อยสลายโดยใช้ เอนไซม์เพื่อผลิตน้ำตาลที่พร้อมสำหรับการหมัก เนื่องจากการพรีทรีทเมนต์ช่วยสลาย ส่วนประกอบของ ชีวมวลประเภทลิกโนเซลลูโลสิก เช่น ลิกนิน ซึ่งลดประสิทธิภาพของการ เข้าถึงของเอนไซม์ในการย่อยสลาย งานวิจัยนี้ใช้การพรีทรีทเมนต์แบบสองขั้นตอนคือ พรีทรีท เมนต์ด้วยโซเดียมไฮดรอกไซด์ตามด้วยกรดซัลฟิวริก จุดประสงค์ของงานวิจัยนี้คือการหาสภาวะ ที่เหมาะสมสำหรับการ พรีทรีทเมนต์ซังข้าวโพดแบบสองขั้นตอนด้วยไมโครเวฟโดยใช้วิธีการ แสดงผลดอปสนองแบบ โครงร่างพื้นผิว โดยการพรีทรีทเมนต์ด้วยโซเดียมไฮดรอกไซด์ 2 เปอร์เซ็นต์ ด้วยอัตราส่วนซังข้าวโพด 67 กรัม ต่อสารละลาย 1 ลิตร ที่อุณหภูมิ 100 องศา เซลเซียส เป็นเวลา 30 นาที ตามด้วยกรดซัลฟิวริก 1 เปอร์เซ็นต์ ด้วยอัตราส่วนซังข้าวโพด 106 กรัม ต่อสารละลาย 1 ลิตร ที่อุณหภูมิ 156 องศาเซลเซียส เป็นเวลา 16 นาที ได้ปริมาณน้ำตาล กลูโคสสูงสุด 48.58 กรัมต่อลิตร โดยอัตราส่วนซังข้าวโพดต่อสารละลายและอุณหภูมิเป็นตัว แปรสำคัญในการพรีทรีทเมนต์นี้ การหมักน้ำตาลหลังจากการย่อยด้วยเอนไซม์เพื่อผลิตอะซิโตน , บิวทานอล และเอทานอล โดยมีการกำจัดสารที่เป็นพิษต่อแบคทีเรียที่ผลิตบิวทานอลด้วย แคลเซียมไฮดรอกไซด์และเจือจางสารละลาย 4 เท่าด้วยน้ำ ทำให้ได้ปริมาณอะซิโตน, บิวทานอล และเอทานอลสูงสุดคือ 8.43 กรัมต่อลิตร

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