

## SINTESIS *HYDROXYPROPYL CELLULOSE* (HPC) DARI SELULOSA LIMBAH TONGKOL JAGUNG (*Zea mays L.*)

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### INTISARI

Sintesis *Hydroxypropyl Cellulose* (HPC) dari selulosa limbah tongkol jagung telah dilakukan. Tujuan penelitian yaitu untuk mengetahui karakteristik dan kadar selulosa dari tongkol jagung sebagai bahan dasar dalam sintesis selulosa termodifikasi yaitu HPC serta mengetahui kondisi optimum proses sintesis HPC kualitas *food grade* dengan variasi konsentrasi NaOH, propilen oksida dan suhu berdasarkan *Response Surface Methodology* (RSM). Proses sintesis HPC dibagi menjadi 2 tahap yaitu ekstraksi selulosa dan optimasi sintesis HPC.

Ekstraksi selulosa dari tongkol jagung dilakukan menggunakan larutan NaOH 8% (b/v) kemudian proses *bleaching* menggunakan larutan NaOCl 6% (v/v) dan NaHSO<sub>3</sub> 3% (b/v). Optimasi sintesis HPC diawali dengan penentuan titik nol kondisi sintesis HPC. Pada optimasi sintesis HPC digunakan variabel bebas yaitu konsentrasi NaOH ( $x_1$ ) terdiri dari 1,6; 5,0; 10,0; 15,0; dan 18,4% (b/v), propilen oksida ( $x_2$ ) terdiri dari 2,3; 3,0; 4,0; 5,0; dan 5,7 mL dan suhu reaksi hidroksipropilasi ( $x_3$ ) terdiri dari 41,6; 45,0; 50,0; 55,0; dan 58,4 °C. Senyawa yang didapatkan dianalisis menggunakan spektrometer *Fourier Transform Infrared Spectroscopy* (FTIR), spektrofotometer UV-Vis, SEM-EDX serta analisis sifat fisiko-kimia yaitu kadar air, kadar abu, *water holding capacity* (WHC), dan *oil holding capacity* (OHC).

Hasil penelitian menunjukkan bahwa selulosa telah berhasil diekstraksi dengan rendemen 35,55% dan kadar selulosa 56,70%. Berdasarkan RSM didapatkan kondisi optimum reaksi hidroksipropilasi dengan konsentrasi NaOH 10,0% (b/v), propilen oksida 4,0 mL, dan suhu 50,0 °C dan prediksi nilai molar substitusi (MS) sebesar 0,278. Hasil sintesis HPC dengan kondisi optimum didapatkan padatan berwarna putih dengan nilai MS sebesar 0,28 yang memenuhi kualitas *food grade*, WHC 4,17 g g<sup>-1</sup>, dan OHC 2,39 g g<sup>-1</sup>. Karakteristik FTIR selulosa dan HPC yang didapatkan mirip dengan selulosa komersial dan HPC komersial. Hasil SEM-EDX menunjukkan adanya perubahan morfologi dari selulosa ke HPC menjadi lebih teratur.

Kata kunci: *food grade*, HPC, MS, RSM, tongkol jagung.

## ***SYNTHESIS OF HYDROXYPROPYL CELLULOSE (HPC) FROM CORN COB WASTES CELLULOSE (Zea mays L.)***

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### **ABSTRACT**

Synthesis of hydroxypropyl cellulose (HPC) from corn cob waste cellulose has been carried out. The purpose of this research was to determine the characteristics and cellulose content on corn cobs as a raw material in the synthesis of modified cellulose to form food grade HPC and to determine the optimum conditions for the process of synthesis HPC at various concentrations of NaOH, propylene oxide, and temperature based on Response Surface Methodology (RSM). HPC synthesis was divided into 2 steps which are cellulose extraction and optimization.

Extraction of cellulose from corn cob were carried out using NaOH 8% (w/v) followed by bleaching process with NaOCl 6% (v/v) and NaHSO<sub>3</sub> 3% (w/v) solutions. Optimization of HPC synthesis were begins with determination of the zero point of HPC synthesis. RSM were used to determine the optimum conditions for HPC synthesis. In the optimization of synthesis of HPC, independent variables were used are concentration of NaOH ( $x_1$ ) consisted of 1.6; 5.0; 10.0; 15.0; 18.4% (w/v), propylene oxide ( $x_2$ ) consisted of 2.3; 3; 4; 5; and 5.7 mL and the reaction temperature of hydroxypropylation ( $x_3$ ) 41.6; 45.0; 50.0; 55.0; and 58.4 °C. The extracted cellulose and synthesized HPC were analyzed using a spectrometer Fourier Transform Infrared Spectroscopy (FTIR), spectrophotometer UV-Vis, SEM-EDX and analysis of physico-chemical properties which are water content, ash content, water holding capacity (WHC), and oil holding capacity (OHC).

The results showed that cellulose was successfully extracted with a percent yield and cellulose content 35.55% and 56.70, respectively. The optimum conditions based on RSM for the synthesis of HPC were reached at concentration of NaOH 10.0% (w/v), propylene oxide volume of 4.0 mL, and temperature of 50.0 °C with a predictive molar substitution (MS) value of 0.278. The experimental results from optimized HPC obtained a white solid with value of MS is 0.28 which has qualified for food grade quality, WHC 4.17 g g<sup>-1</sup>, and OHC 2.39 g g<sup>-1</sup>. The FTIR characteristics of cellulose and HPC obtained were similar to the commercial cellulose and HPC. Based on the SEM-EDX, the morphology changed to be more well-organized from cellulose to HPC.

Keywords: corn cobs, food grade, HPC, MS, RSM.