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SINTESIS DAN KARAKTERISASI NATRIUM CARBOXYMETHYL CELLULOSE (Na-CMC) DARI SERBUK KAYU JATI (*Tectona grandis* L.f.) MENGGUNAKAN MEDIA REAKSI ISOPROPANOL-ETANOL

ABSTRAK

Latar Belakang: Serbuk kayu jati (*Tectona grandis* L.f.) merupakan limbah lignoselulosa yang berpotensi dimanfaatkan sebagai sumber selulosa untuk sintesis Na-CMC, yang banyak digunakan sebagai eksipien farmasi. Penelitian ini bertujuan untuk mensintesis Na-CMC dari selulosa serbuk kayu jati serta mengevaluasi pengaruh rasio media reaksi isopropanol:etanol terhadap rendemen dan karakteristik fisikokimianya.

Metode: Selulosa diisolasi melalui proses delignifikasi menggunakan NaOH 20% dan *bleaching* dengan H₂O₂ 15%, kemudian disintesis menjadi Na-CMC melalui tahap alkalisasi dan karboksimetilasi menggunakan natrium monokloroasetat. Variasi rasio media reaksi yang digunakan adalah isopropanol:etanol 50:50 dan 80:20. Karakterisasi meliputi rendemen, organoleptik, kadar air, pH, viskositas, *swelling*, dan kemurnian. Data dianalisis menggunakan uji *Kruskal-Wallis* dan *Mann-Whitney* serta dikonfirmasi dengan analisis FTIR.

Hasil: Hasil menunjukkan rendemen Na-CMC sintesis sebesar 65,62% (50:50) dan 68,41% (80:20). Na-CMC sintesis berwarna krem hingga krem kekuningan, dengan kadar air 5,22–6,14%, pH 6,72–6,78, viskositas 180–197 cP, *swelling* 1195–1328%, kemurnian 96,69–97,08%, dan nilai derajat substitusi (DS) berada pada kisaran 0,87–1,03. Analisis FTIR menunjukkan terbentuknya pita khas gugus karboksilat (–COO[–]) asimetris pada sekitar 1587–1588 cm^{–1} dan pita simetris pada 1414–1415 cm^{–1} yang mengonfirmasi keberhasilan reaksi karboksimetilasi. Nilai tersebut lebih rendah dibandingkan Na-CMC komersial, namun secara umum telah memenuhi karakteristik dasar Na-CMC. Rasio media reaksi 80:20 menghasilkan sifat fisikokimia yang lebih baik dibandingkan 50:50.

Kesimpulan: Serbuk kayu jati berpotensi sebagai sumber selulosa alternatif untuk sintesis Na-CMC, dengan rasio isopropanol:etanol 80:20 menghasilkan karakteristik fisikokimia yang lebih baik dan mendekati Na-CMC komersial.

Kata Kunci: Serbuk kayu jati, Na-CMC, media reaksi, isopropanol-etanol

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SYNTHESIS AND CHARACTERIZATION OF NATRIUM CARBOXYMETHYL CELLULOSE (Na-CMC) FROM TEAK WOOD POWDER (*Tectona grandis* L.f.) USING ISOPROPANOL-ETHANOL REACTION MEDIA

ABSTRACT

Background: Teak wood powder (*Tectona grandis* L.f.) is a lignocellulosic waste with the potential to be utilized as a cellulose source for the synthesis of Na-CMC, which is widely used as a pharmaceutical excipient. This study aimed to synthesize Na-CMC from teak wood powder cellulose and to evaluate the effect of the isopropanol:ethanol reaction media ratio on its yield and physicochemical characteristics.

Methods: Cellulose was isolated through a delignification process using 20% NaOH and bleaching with 15% H_2O_2 , then synthesized into Na-CMC through alkalization and carboxymethylation steps using sodium monochloroacetate. The reaction media ratios used were 50:50 and 80:20. Characterization included yield, organoleptic properties, water content, pH, viscosity, swelling, and purity. Data were analyzed using the Kruskal–Wallis and Mann–Whitney tests and confirmed by FTIR analysis.

Result: The results showed that the yield of synthetic Na-CMC was 65.62% (50:50) and 68.41% (80:20). The synthetic Na-CMC was cream to yellowish cream in color, with a water content of 5.22–6.14%, pH 6.72–6.78, viscosity of 180–197 cP, swelling of 1195–1328%, purity of 96.69–97.08%, and the degree of substitution (DS) value was in the range of 0.87–1.03. FTIR analysis showed the formation of a characteristic asymmetric carboxylate group ($-COO^-$) band at around $1587\text{--}1588\text{ cm}^{-1}$ and a symmetric band at $1414\text{--}1415\text{ cm}^{-1}$, confirming the success of the carboxymethylation reaction. This value is lower than that of commercial Na-CMC, but generally meets the basic characteristics of Na-CMC. The reaction media ratio of 80:20 produces better physicochemical properties than 50:50.

Conclusion: Teak wood powder has the potential to be an alternative cellulose source for Na-CMC synthesis, with an isopropanol:ethanol ratio of 80:20 producing better physicochemical characteristics and approaching those of commercial Na-CMC.

Keywords: Teak wood powder, cellulose, Na-CMC, reaction medium, Na-CMC characteristics.