ABSTRAK

Kitosan merupakan biopolimer yang banyak dimanfaatkan sebagai material antibakteri. Namun, aktivitas antibakteri kitosan masih dapat ditingkatkan melalui modifikasi struktur kimia dan pembentukan komposit dengan logam. Penelitian ini bertujuan mensintesis 6-deoksi-6-L-arginin-basa Schiff kitosan berbasis benzaldehida dan veratraldehida serta kompositnya dengan logam perak (Ag) sebagai material yang berpotensi memiliki kemampuan *capping agent* dan aktivitas antibakteri yang lebih baik. Sintesis diawali dengan pembentukan basa Schiff kitosan melalui reaksi kondensasi kitosan dengan benzaldehida dan veratraldehida, dilanjutkan dengan tosilasi pada posisi C6 menggunakan *p*-sulfoniltoluen dan substitusi menggunakan L-arginin. Produk yang diperoleh selanjutnya dibuat komposit dengan Ag. Seluruh produk dikarakterisasi menggunakan spektrofotometer UV-Vis dan FT-IR, sedangkan komposit dikarakterisasi lebih lanjut menggunakan SEM-EDX. Kitosan yang digunakan memiliki derajat deasetilasi sebesar 73% dan berat molekul 73.840,59 g/mol. Basa Schiff kitosan-benzaldehida dan basa Schiff kitosan-veratraldehida berhasil disintesis dengan derajat substitusi masing-masing sebesar 37,40% dan 47,35%, sedangkan senyawa 6-deoksi-6-L-arginin-basa Schiff kitosan-benzaldehida dan 6-deoksi-6-L-arginin-basa Schiff kitosan-veratraldehida memiliki derajat substitusi masing-masing sebesar 7,85% dan 22,10%. Komposit 6-deoksi-6-L-arginin-basa Schiff kitosan-veratraldehida/Ag menunjukkan aktivitas antibakteri tertinggi dengan persentase penurunan jumlah koloni bakteri sebesar 93% pada konsentrasi 1000 ppm dan 96% pada konsentrasi 2500 ppm setelah 7 hari penyimpanan. Hasil penelitian menunjukkan bahwa modifikasi kitosan melalui pembentukan basa Schiff, substitusi L-arginin, dan pengompositan dengan Ag berpotensi meningkatkan aktivitas antibakteri.

Kata kunci: kitosan, basa Schiff, L-arginin, veratraldehida, perak, antibakteri.

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ABSTRACT

Chitosan is a biopolymer widely utilized as an antibacterial material. However, its antibacterial activity can be further enhanced through chemical structure modification and composite formation with metals. This study aims to synthesize benzaldehyde- and veratraldehyde-based 6-deoxy-6-L-arginine-Schiff base chitosan, as well as their composites with silver (Ag), to develop materials with potentially improved capping agent capabilities and enhanced antibacterial activity. The synthesis began with the formation of a chitosan Schiff base through the condensation reaction of chitosan with either benzaldehyde or veratraldehyde. This was followed by tosylation at the C6 position using p-toluenesulfonyl chloride (tosyl chloride) and subsequent substitution with L-arginine. The resulting products were then utilized to form composites with Ag. All synthesized products were characterized using UV-Vis and FT-IR spectrometers, while the Ag-composites were further analyzed via SEM-EDX. The initial chitosan had a degree of deacetylation of 73% and a molecular weight of 73,840.59 g/mol. The chitosan-benzaldehyde and chitosan-veratraldehyde Schiff bases were successfully synthesized with degrees of substitution of 37.40% and 47.35%, respectively. Meanwhile, the 6-deoxy-6-L-arginine-chitosan-benzaldehyde and 6-deoxy-6-L-arginine-chitosan-veratraldehyde Schiff bases exhibited degrees of substitution of 7.85% and 22.10%, respectively. Among the variants, the 6-deoxy-6-L-arginine-chitosan-veratraldehyde/Ag Schiff base composite exhibited the highest antibacterial activity, achieving a bacterial colony reduction of 93% at a concentration of 1000 ppm and 96% at 2500 ppm after 7 days of storage. These results indicate that modifying chitosan through Schiff base formation, L-arginine substitution, and silver composite formation significantly enhances its potential antibacterial activity.

Keywords: *chitosan, Schiff base, L-arginine, veratraldehyde, silver, antibacterial*

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