

ABSTRAK

Kitosan merupakan biopolimer ramah lingkungan yang memiliki aktivitas antibakteri alami, namun efektivitasnya masih terbatas sehingga diperlukan modifikasi struktur untuk meningkatkan efektivitasnya. Pendekatan yang dapat dilakukan melalui pembentukan basa Schiff, substitusi L-arginin pada posisi C6 dan penambahan nanopartikel perak. Penelitian ini bertujuan untuk mensintesis dan mengkarakterisasi komposit 6-deoksi-6-L-arginin basa Schiff kitosan-orto-vanilin/Ag serta mengevaluasi aktivitas antibakterinya. Sintesis diawali dengan pembentukan basa Schiff kitosan-benzaldehida (BSK-B) dan kitosan-orto-vanilin (BSK-OV), dilanjutkan dengan reaksi tosilasi pada gugus OH di C6 kitosan, substitusi L-arginin dan pembentukan komposit berbasis perak. Produk hasil sintesis dikarakterisasi menggunakan UV-Vis, FTIR, dan SEM-EDX-*Mapping*, sedangkan aktivitas antibakteri diuji menggunakan metode *Total Plate Count* (TPC) pada sampel daging ayam. Hasil penelitian menunjukkan bahwa BSK-B dan BSK-OV berhasil disintesis dengan rendemen masing-masing 94,26% dan 76,42%, serta derajat substitusi (DS) sebesar 37,40% dan 93,64%. Substitusi L-arginin menghasilkan senyawa 6-deoksi-6-L-arginin basa Schiff kitosan-benzaldehida (DA-BSK-B) dan senyawa 6-deoksi-6-L-arginin basa Schiff kitosan-orto-vanilin (DA-BSK-OV) dengan rendemen berturut-turut 75,68% dan 88,15%, serta peningkatan DS sebesar 7,85% dan 18,42% yang menandakan keberhasilan pemasukan gugus arginin ke dalam struktur kitosan. Pembentukan komposit dengan logam perak menghasilkan komposit kitosan/Ag, BSK-B/Ag, BSK-OV/Ag, DA-BSK-B/Ag dan DA-BSK-OV/Ag. Karakterisasi UV-Vis menunjukkan munculnya pita serapan *Surface Plasmon Resonance* (SPR) khas nanopartikel perak, sedangkan FTIR dan SEM-EDX-*Mapping* mengonfirmasi keberhasilan pembentukan komposit serta keberadaan unsur perak pada material. Hasil uji antibakteri menunjukkan komposit DA-BSK-OV/Ag memiliki aktivitas antibakteri tertinggi dengan persentase penurunan jumlah koloni bakteri sebesar 96% setelah penyimpanan selama 7 hari.

Kata kunci : kitosan, orto-vanilin, basa Schiff, L-arginin, nanopartikel perak, aktivitas antibakteri.

ABSTRACT

Chitosan is an environmentally friendly biopolymer that possesses natural antibacterial activity; however, its effectiveness remains limited, necessitating structural modifications to enhance its efficacy. Approaches that can be adopted include the formation of Schiff bases, the substitution of L-arginine at the C6 position, and the addition of silver nanoparticles. This study aims to synthesise and characterise a 6-deoxy-6-L-arginine chitosan-ortho-vanillin/Ag Schiff base composite and to evaluate its antibacterial activity. The synthesis began with the formation of chitosan-benzaldehyde (BSK-B) and chitosan-ortho-vanillin (BSK-OV) Schiff bases, followed by tosylation of the OH group at the C6 position of chitosan, L-arginine substitution and the formation of silver-based composites. The synthetic products were characterised using UV-Vis, FTIR and SEM-EDX-Mapping, whilst antibacterial activity was tested using the Total Plate Count (TPC) method on chicken meat samples. The results of the study showed that BSK-B and BSK-OV were successfully synthesised with yields of 94.26% and 76.42% respectively, and degrees of substitution (DS) of 37.40% and 93.64%. The substitution of L-arginine resulted in the compounds 6-deoxy-6-L-arginine Schiff base chitosan-benzaldehyde (DA-BSK-B) and 6-deoxy-6-L-arginine Schiff base chitosan-ortho-vanillin (DA-BSK-OV) with yields of 75.68% and 88.15% respectively, as well as increases in DS of 7.85% and 18.42%, indicating the successful incorporation of arginine groups into the chitosan structure. The formation of composites with silver yielded chitosan/Ag, BSK-B/Ag, BSK-OV/Ag, DA-BSK-B/Ag and DA-BSK-OV/Ag composites. UV-Vis characterisation revealed the appearance of a Surface Plasmon Resonance (SPR) absorption band characteristic of silver nanoparticles, whilst FTIR and SEM-EDX-Mapping confirmed the successful formation of the composites and the presence of silver in the material. The results of the antibacterial tests showed that the DA-BSK-OV/Ag composite exhibited the highest antibacterial activity, with a 96 per cent reduction in bacterial colony count after 7 days' storage.

Keywords: *chitosan, ortho-vanillin, Schiff's base, L-arginine, silver nanoparticles, antibacterial activity.*