

ABSTRAK

Pengembangan material *coating* film berbahan dasar biopolimer dan senyawa aktif antibakteri menarik perhatian dalam industri makanan maupun kesehatan. Aplikasi material *coating* film banyak digunakan sebagai kemasan baik untuk makanan, peralatan medis, pembalut luka, dan pengolahan air. Penelitian ini bertujuan untuk melakukan sintesis coating film berbasis kitosan-gelatin dengan kopolimer eugenol-alil eugenol (PEAE) dan uji kemampuan antibakterinya.

Penelitian diawali dengan sintesis kopolimer eugenol-alil eugenol (PEAE) melalui reaksi polimerisasi adisi kationik menggunakan katalis $\text{BF}_3\text{O}(\text{C}_2\text{H}_5)_2$. Karakterisasi hasil sintesis PEAE meliputi analisis FTIR, berat molekul, dan kelarutan. Tahap berikutnya adalah sintesis coating film kitosan-gelatin dengan variasi konsentrasi PEAE sebesar 1,25%; 2,5%; dan 3,75%. Karakterisasi *coating* film meliputi analisis FTIR, SEM, kuat tarik (TS), persen perpanjangan (E%), dan sudut kontak. Tahap terakhir yaitu uji aktivitas antibakteri untuk mendapatkan efektivitas terbaik dari penambahan variasi konsentrasi PEAE.

Sintesis kopolimer eugenol-alil eugenol (PEAE) menghasilkan padatan coklat dengan rendemen sebesar 94,91%, berat molekul 9.553,98 Da, dan titik leleh dalam rentang 95-98°C. PEAE dapat larut dalam pelarut metanol, etanol, toluene, dikloro metana, DMSO, asetil asetat, dan kloroform. Sintesis *coating* film dengan variasi kontrol; PEAE 1,25; PEAE 2,5; dan PEAE 3,75 didapatkan hasil berupa lapisan *coating* tipis, berwarna kuning kecoklatan, nilai kuat tarik yang secara berturut-turut semakin menurun, dan nilai persen perpanjangan semakin meningkat. Aktivitas antibakteri terbaik diperoleh pada film PEAE 2,5 dengan persen penghambatan terhadap bakteri *Staphylococcus aureus* sebesar 99,71% dan terhadap bakteri *Escherichia coli* sebesar 98,39%.

Kata kunci : kopolimer eugenol-alil eugenol (PEAE), kitosan-gelatin, *coating film* antibakteri

ABSTRACT

The development of coating film materials based on biopolymers and antibacterial active compounds is attracting attention in the food and health industries. The application of coating film materials is widely used for packaging, medical equipment, wound dressings, and water treatment. This research aims to synthesize a chitosan-gelatin-based coating film with eugenol-allyl eugenol copolymer (PEAE) and test its antibacterial capability.

The research began with the synthesis of eugenol-allyl eugenol copolymer (PEAE) through cationic addition polymerization using $\text{BF}_3\text{O}(\text{C}_2\text{H}_5)_2$ as a catalyst. The characterization of the PEAE synthesis included FTIR analysis, molecular weight measurement, and solubility tests. The next step is synthesis of chitosan-gelatin coating films with PEAE concentration variations of 1.25%, 2.5%, and 3.75%. The characterization of the coating films includes FTIR analysis, SEM, tensile strength (TS), elongation percentage (E%), and contact angle measurement. The final stage is the antibacterial activity test to determine the best effectiveness from the addition of PEAE concentration variations.

*The synthesis of eugenol-allyl eugenol copolymer (PEAE) resulted in a brown solid PEAE with a yield of 94.91%, a molecular weight of 9,553.979 Da, and a melting point range of 95-98°C. PEAE is soluble in methanol, ethanol, toluene, dichloromethane, DMSO, ethyl acetate, and chloroform. The synthesis of the coating films with variations control; PEAE 1.25, PEAE 2.5, and PEAE 3.75 resulted in thin coating layers, yellowish-brown in color, with decreasing tensile strength values and increasing elongation percentage values. The best antibacterial activity was obtained with the PEAE 2.5 film, with an inhibition percentage against *Staphylococcus aureus* of 99.71% and against *Escherichia coli* of 98.39%.*

Keywords : *copolymer eugenol-allyl eugenol (PEAE), chitosan-gelatin, antibacterial coating film*