ABSTRAK

Ceria Tua Sitorus (8226141003) Sintesis Nanopartikel Perak, Tembaga Dan Seng Oksida Sebagai Bahan Antibakteri Dalam Menghambat Pertumbuhan Bakteri Staphylococcus Aureus Dan Escherichia Coli.

Penelitian melakukan sintesis dan karakterisasi nanopartikel perak (Ag), tembaga (Cu), dan seng oksida (ZnO) dengan metode reduksi kimia serta menguji aktivitas antibakterinya terhadap *Staphylococcus aureus* dan *Escherichia coli*. Sintesis dilakukan menggunakan prekursor perak nitrat, tembaga(II) nitrat trihidrat, dan seng asetat dalam pelarut isopropil alkohol dengan penambahan agen pereduksi natrium borohidrida, asam askorbat, serta kombinasi urea dan NaOH. Karakterisasi nanopartikel memakai Particle Size Analyzer, Zeta Potensial, dan Spektrometri ICP-OES. Hasil menunjukkan ukuran partikel Ag, Cu, dan ZnO berturut-turut adalah 60,36 nm, 345,1 nm, dan 153,33 nm. Nilai zeta potensial nanopartikel Ag -19,2 mV, nanopartike ZnO -12,6 mV, dan nanopartikel Cu -9,5 mV. Uji antibakteri dengan metode difusi cakram menunjukkan bahwa nanopartikel Ag menghasilkan zona hambat terbesar terhadap *S. aureus* sebesar 11,07 mm dan *E. coli* sebesar 7,7 mm pada konsentrasi larutan nanopartikel Ag 15%. Hasil mengindikasikan ukuran partikel yang lebih kecil dan stabilitas muatan partikel yang lebih baik berkontribusi terhadap efektivitas antibakteri yang lebih tinggi.

Kata kunci: nanopartikel logam, reduksi kimia, antibakteri, *Staphylococcus aureus*, *Escherichia coli*

ABSTRACT

Ceria Tua Sitorus (8226141003) Synthesis of Silver, Copper, and Zinc Oxide Nanoparticles as Antibacterial Agents Against *Staphylococcus aureus* and *Escherichia coli*.

This study involves the synthesis and characterization of silver (Ag), copper (Cu), and zinc oxide (ZnO) nanoparticles using a chemical reduction method, as well as the evaluation of their antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*. The synthesis was carried out using silver nitrate, copper (II) nitrate trihydrate, and zinc acetate precursors in isopropyl alcohol as the solvent, with sodium borohydride, ascorbic acid, and a combination of urea and NaOH as reducing agents. The nanoparticles were characterized using a Particle Size Analyzer, Zeta Potential Analyzer, and ICP-OES Spectrometry. The results showed that the particle sizes of Ag, Cu, and ZnO nanoparticles were 60.36 nm, 345.1 nm, and 153.33 nm, respectively. The zeta potential values were -19.2 mV for Ag nanoparticles, -12.6 mV for ZnO nanoparticles, and -9.5 mV for Cu nanoparticles. Antibacterial testing using the disk diffusion method revealed that Ag nanoparticles produced the largest inhibition zones against *S. aureus* (11.07 mm) and *E. coli* (7.7 mm) at a nanoparticle solution concentration of 15%. These results indicate that smaller particle size and greater surface charge stability contribute to higher antibacterial effectiveness.

Keywords: metal nanoparticles, chemical reduction, antibacterial, *Staphylococcus aureus*, *Escherichia coli*