

SINTESIS NANOPARTIKEL EMAS (AuNPs) TERTUDUNG ASAM GLUTAMAT DAN NANOKOMPOSIT FILM AuNPs-AGAR/GLUTARALDEHID SEBAGAI ANTIBAKTERI

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INTISARI

Sintesis nanopartikel emas tertudung asam glutamat dan nanokomposit film AuNPs-agar/glutaraldehyd sebagai antibakteri telah dilakukan. Tujuan dari penelitian ini adalah untuk mengetahui kondisi optimal sintesis nanopartikel emas, mengetahui konsentrasi optimal glutaraldehyd dan untuk mengetahui aktivitas antibakteri nanopartikel emas dan nanokomposit film AuNPs-agar/glutaraldehyd.

Penelitian ini diawali dengan sintesis nanopartikel emas (AuNPs) menggunakan larutan HAuCl₄ yang direduksi dan kemudian distabilkan dengan asam glutamat. Pada sintesis AuNPs dilakukan optimasi pH, konsentrasi asam glutamat dan waktu reaksi dan dianalisis dengan spektrofotometer UV-Vis. AuNPs yang disintesis pada kondisi optimal dikarakterisasi dengan *particle size analyzer* (PSA), *transmission electron microscopy* (TEM) dan spektroskopi *fourier transform infrared* (FTIR). Nanokomposit film AuNPs-agar/glutaraldehyd disintesis dengan menggunakan agar dan gliserol, serta penambahan glutaraldehyd sebagai agen taut silang pada berbagai konsentrasi. Kondisi optimal ditentukan dengan mengukur *tensile strength* AuNPs-agar/glutaraldehyd dan film hasil sintesis pada kondisi optimal dikarakterisasi dengan SEM, FTIR, dan XRD. Aktivitas antibakteri koloid AuNPs dan nanokomposit film AuNPs-agar/glutaraldehyd diuji dengan metode difusi sumuran dan difusi cakram terhadap bakteri Gram positif *Bacillus subtilis* dan bakteri Gram negatif *Escherichia coli*.

Hasil penelitian menunjukkan bahwa kondisi optimal sintesis AuNPs adalah pada pH 11 selama 75 menit, dengan konsentrasi HAuCl₄ 60 ppm dan asam glutamat 4 mM. Hasil analisis dengan PSA menunjukkan distribusi ukuran 40 nm dan hasil TEM menunjukkan AuNPs berhasil disintesis dengan bentuk bulat. Konsentrasi optimal glutaraldehyd adalah 0,75 % w/v yang diperoleh dari pengukuran *tensile strength*. Uji antibakteri menunjukkan bahwa semakin tinggi konsentrasi nanopartikel emas, aktivitas antibakteri semakin tinggi di mana aktivitas antibakteri paling baik dimiliki oleh AuNPs 1000 ppm.

Kata kunci: Antibakteri, asam glutamat, AuNPs, glutaraldehyd, nanokomposit film AuNPs-agar/glutaraldehyd

***SYNTHESIS OF GLUTAMIC ACID-CAPPED GOLD NANOPARTICLES
AND AuNPs-AGAR/GLUTARALDEHYDE NANOCOMPOSITE FILM AS
ANTIBACTERIAL AGENT***

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ABSTRACT

Synthesis of glutamic acid-capped gold nanoparticles and AuNPs-agar/glutaraldehyde nanocomposite film as antibacterial agent has been done. The aims of this research are to know the optimum condition of gold nanoparticles synthesis, to know the optimum concentration of glutaraldehyde and to know the antibacterial activity of gold nanoparticles and AuNPs-agar/glutaraldehyde nanocomposite film.

This research was initiated with gold nanoparticles (AuNPs) synthesis using hydrochloroauric acid solution and glutamic acid as capping agent using reduction method. Optimization of pH, glutamic acid concentration, and reaction time were conducted within AuNPs synthesis and the AuNPs was analyzed using UV-Vis spectrophotometer. AuNPs synthesized in optimum condition was characterized with particle size analyzer (PSA), transmission electron microscopy (TEM) and fourier transform infrared spectroscopy (FTIR). AuNPs-agar/glutaraldehyde nanocomposite film was synthesized using agar and gliserol, also glutaraldehyde in various concentrations were used as crosslinker. The optimum condition was determined by measuring the tensile strength of the samples and the synthesized film with the optimum condition was characterized with SEM, FTIR, and XRD. Antibacterial activity of AuNPs colloid and AuNPs-agar/glutaraldehyde was tested using diffusion method towards Gram positive bacteria *Bacillus subtilis* and Gram negative bacteria *Escherichia coli*.

The experiment results showed that the optimum condition of AuNPs synthesis obtained was at pH 11 for 75 minutes, with 60 ppm H₂AuCl₄ and 4 mM glutamic acid. PSA result showed the size distribution which was 40 nm and TEM result showed that the AuNPs was synthesized successfully with spherical shape. The optimum concentration of glutaraldehyde was 0.75 % w/v which was obtained from tensile strength measurement. Antibacterial activity test results showed that the antibacterial activity of the samples would increase as the concentration increase, which shown by antibacterial activity of AuNPs 1000 ppm.

Keywords: Antibacterial, AuNPs, AuNPs-agar/glutaraldehyde nanocomposite film, glutamic acid, glutaraldehyde