

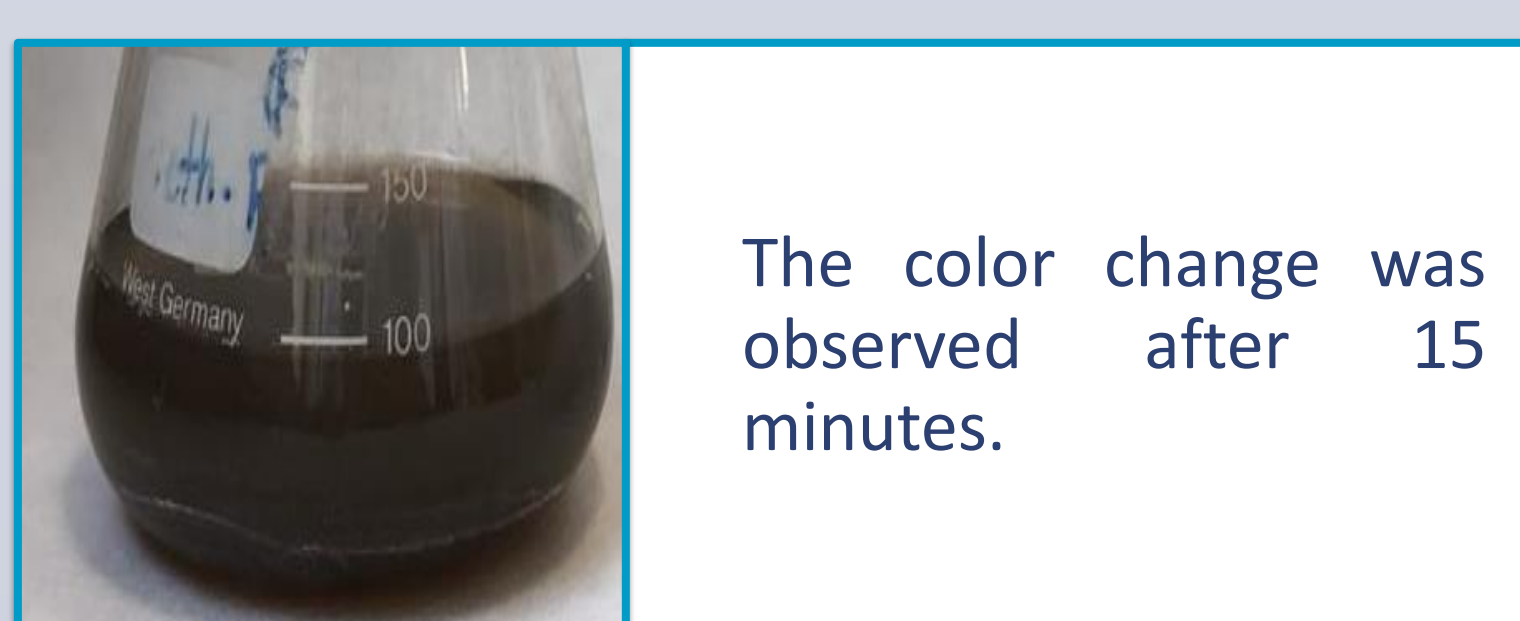
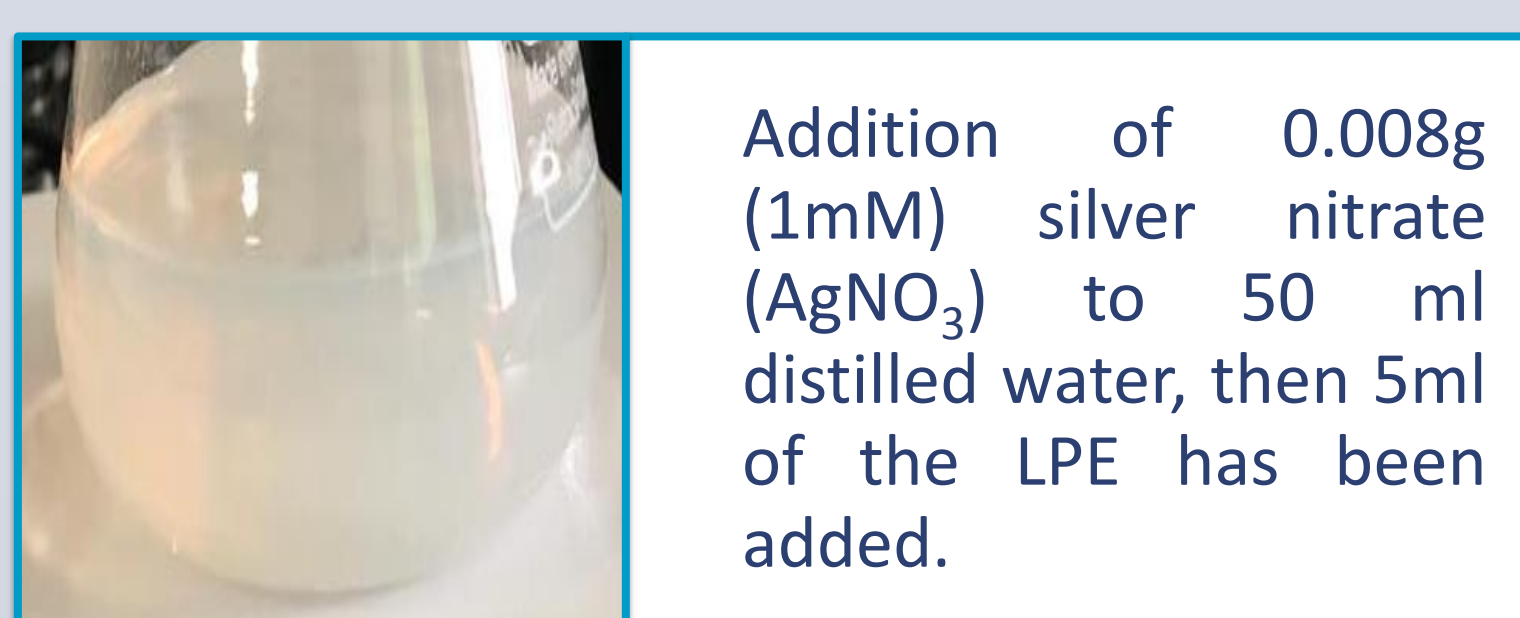
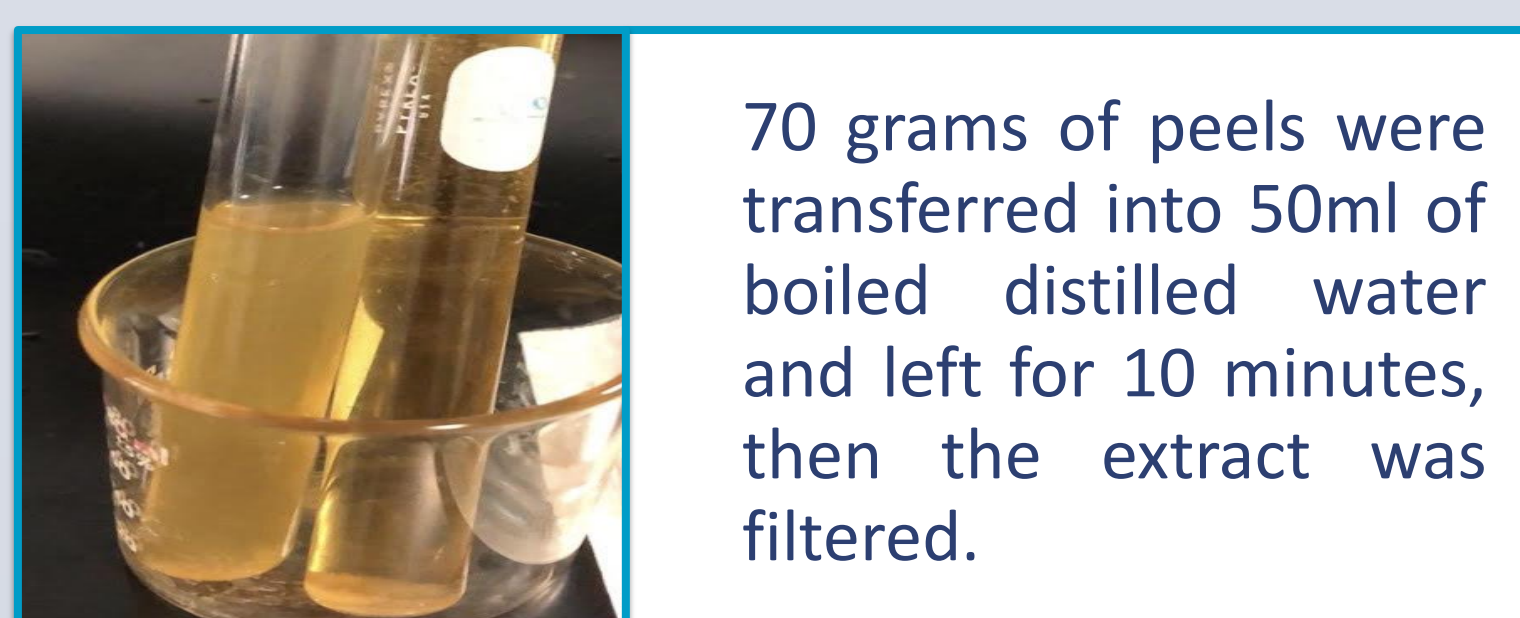
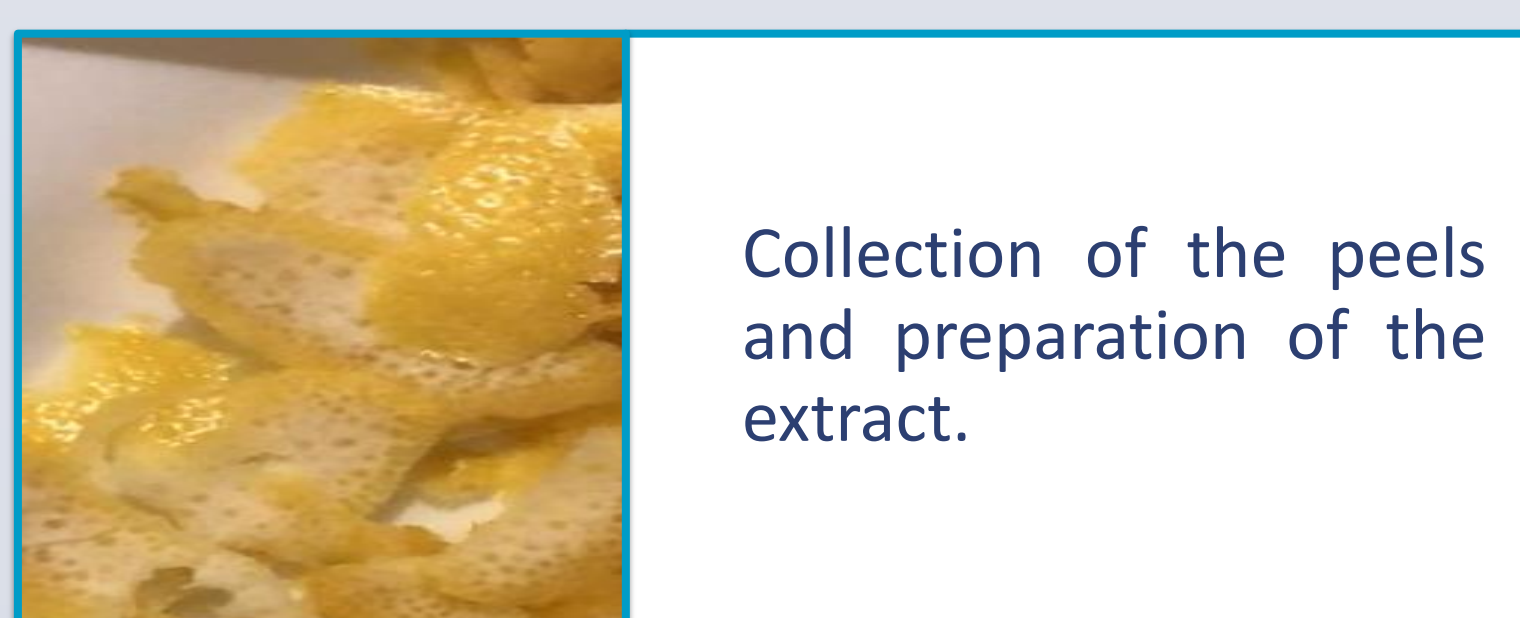
ABSTRACT

Recently, the most serious and common problems facing the field of medicine and threatening the public health is the spread of antibiotic resistant bacteria alongside with the spread of cancer. Therefore it is important to focus on evolving effective alternative therapeutic agents, especially those obtained from nature, for they are reliable, eco-friendly, nontoxic and with fewer side effects compared with the treatments used nowadays. One approach that shows immense potential is based on the green synthesis of silver nanoparticles using biological waste products such as lemon (*Citrus limon*) peels. Characterization of the green synthesized AgNPs was carried out using UV-Visible spectrophotometer, DLS, TEM, EDX and FTIR. The green synthesized AgNPs exhibited an effective antibacterial activity against the tested bacteria of *Acinetobacter baumannii*, *Salmonella typhimurium*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Proteus vulgaris*, and a combination effect of the AgNPs with different antibiotics against the same tested bacteria. The AgNPs also displayed a cytotoxic activity on the cell lines of MCF-7 and HCT-116.

OBJECTIVES

- To green synthesize silver nanoparticles using lemon peels extract (LPE) and characterize them using: UV spectrophotometer, DLS, TEM, EDX and FTIR.
- To evaluate the antibacterial activity of the green synthesized AgNPs.
- To evaluate the combination effect of the green synthesized silver nanoparticles with different antibiotics against different bacteria.
- To evaluate the cytotoxic activity of the green synthesized silver nanoparticles on the cell lines of MCF-7 & HCT-116.

METHODOLOGY



RESULTS

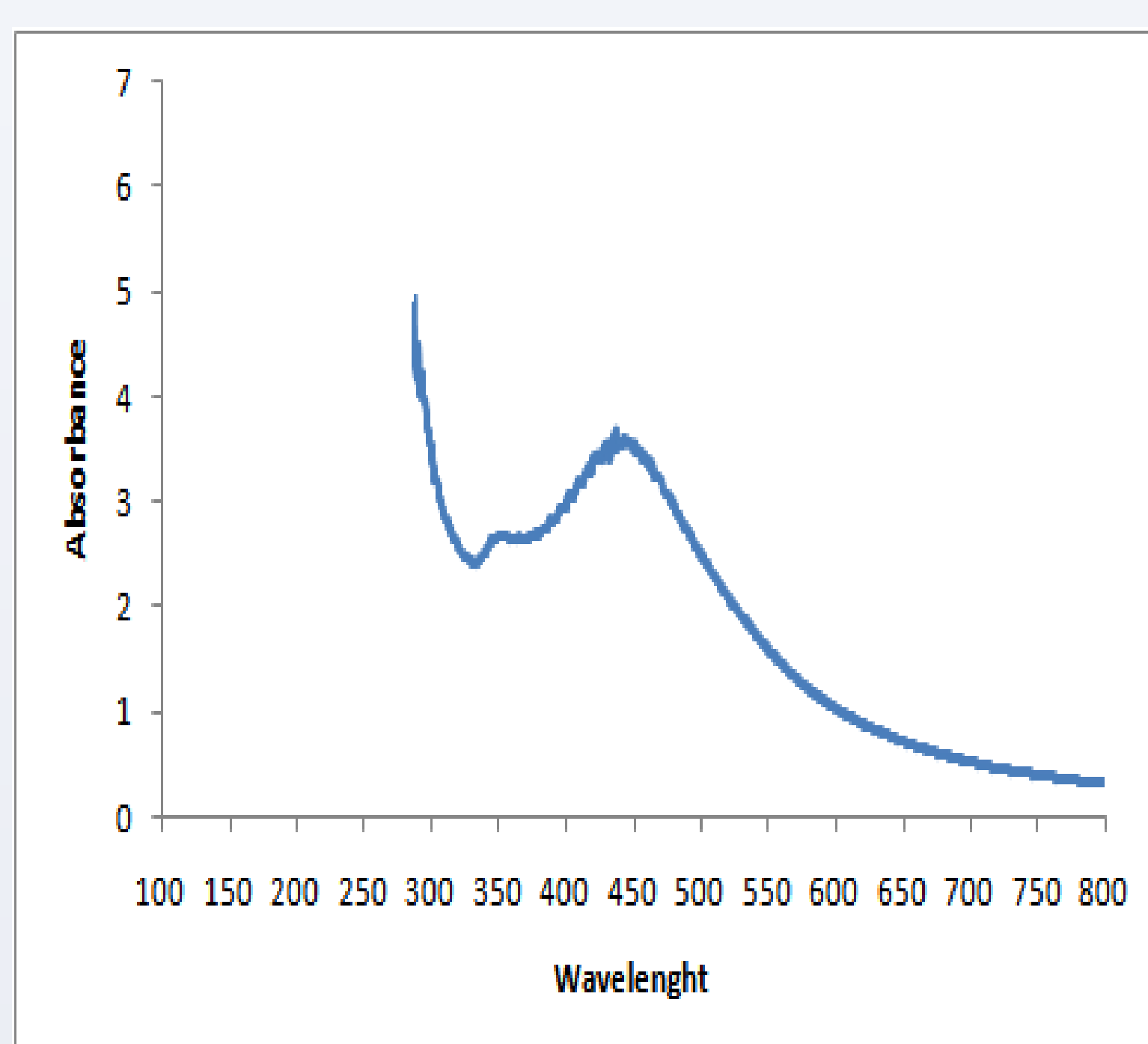


Figure-1: UV-visible spectra of AgNPs with an absorption peak at 437 nm.

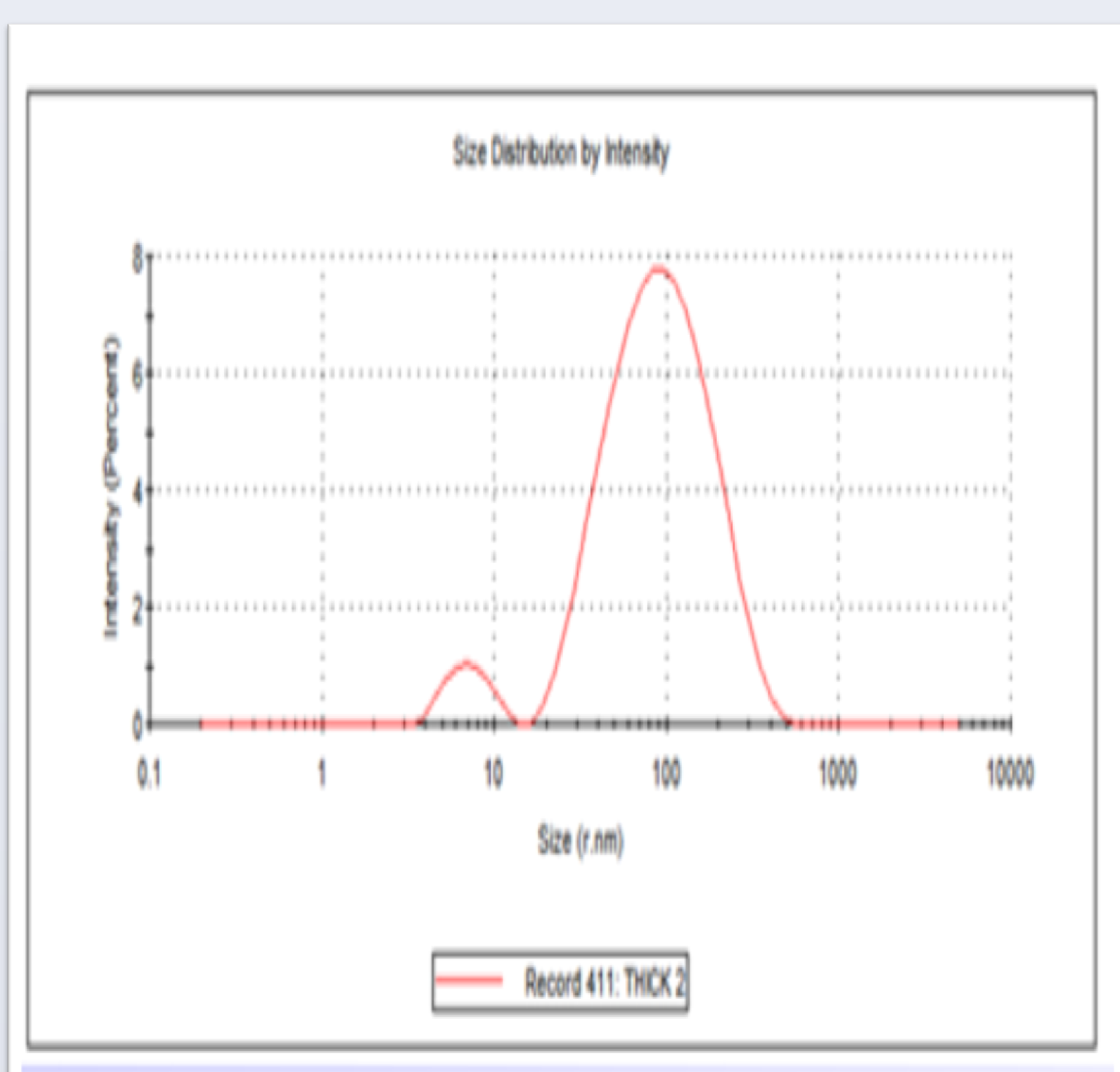


Figure-2: DLS Particles distribution, average particle size was 59.74 r.nm.

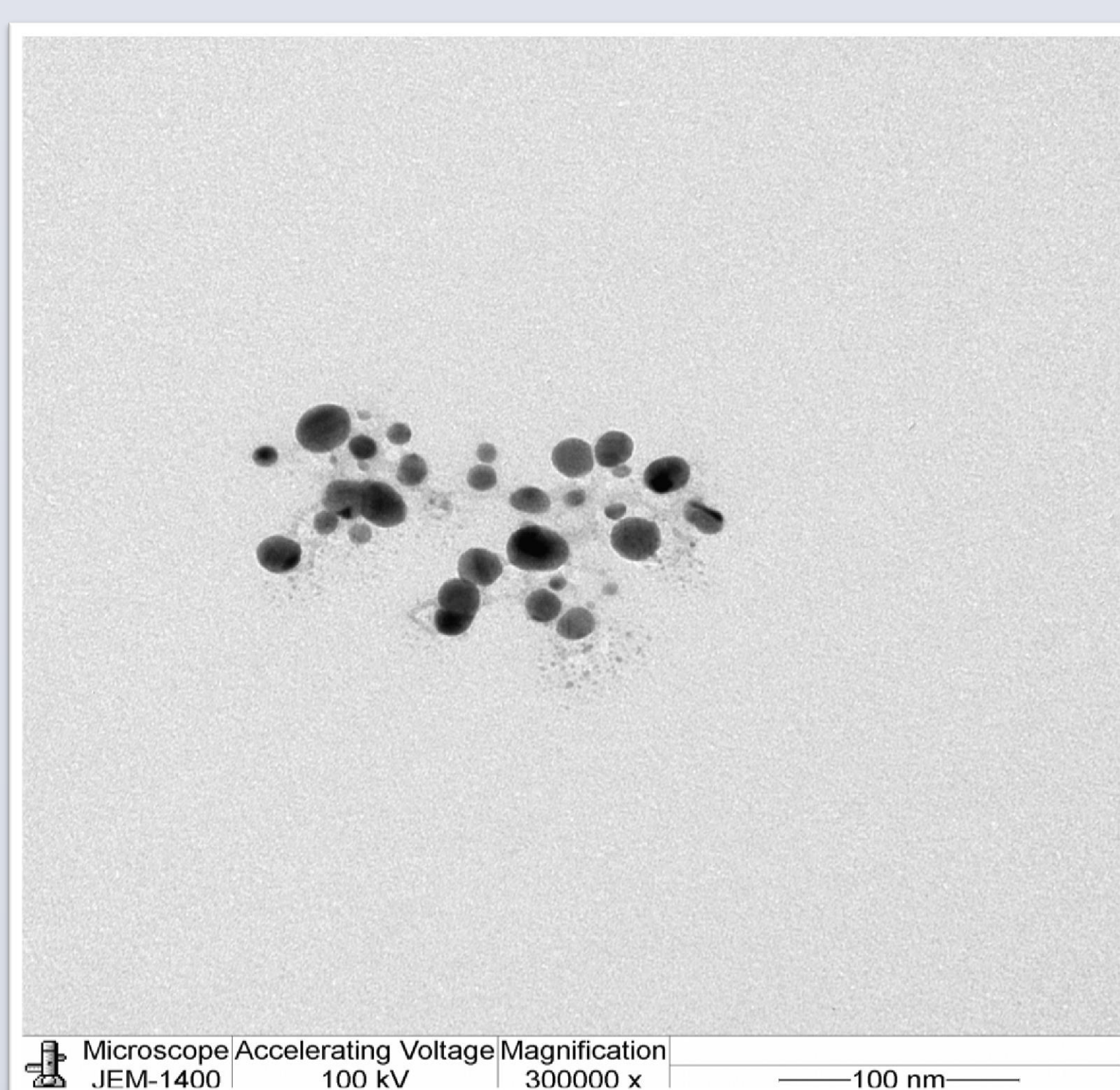


Figure-3: TEM images, most nanoparticles are spherical in shape.

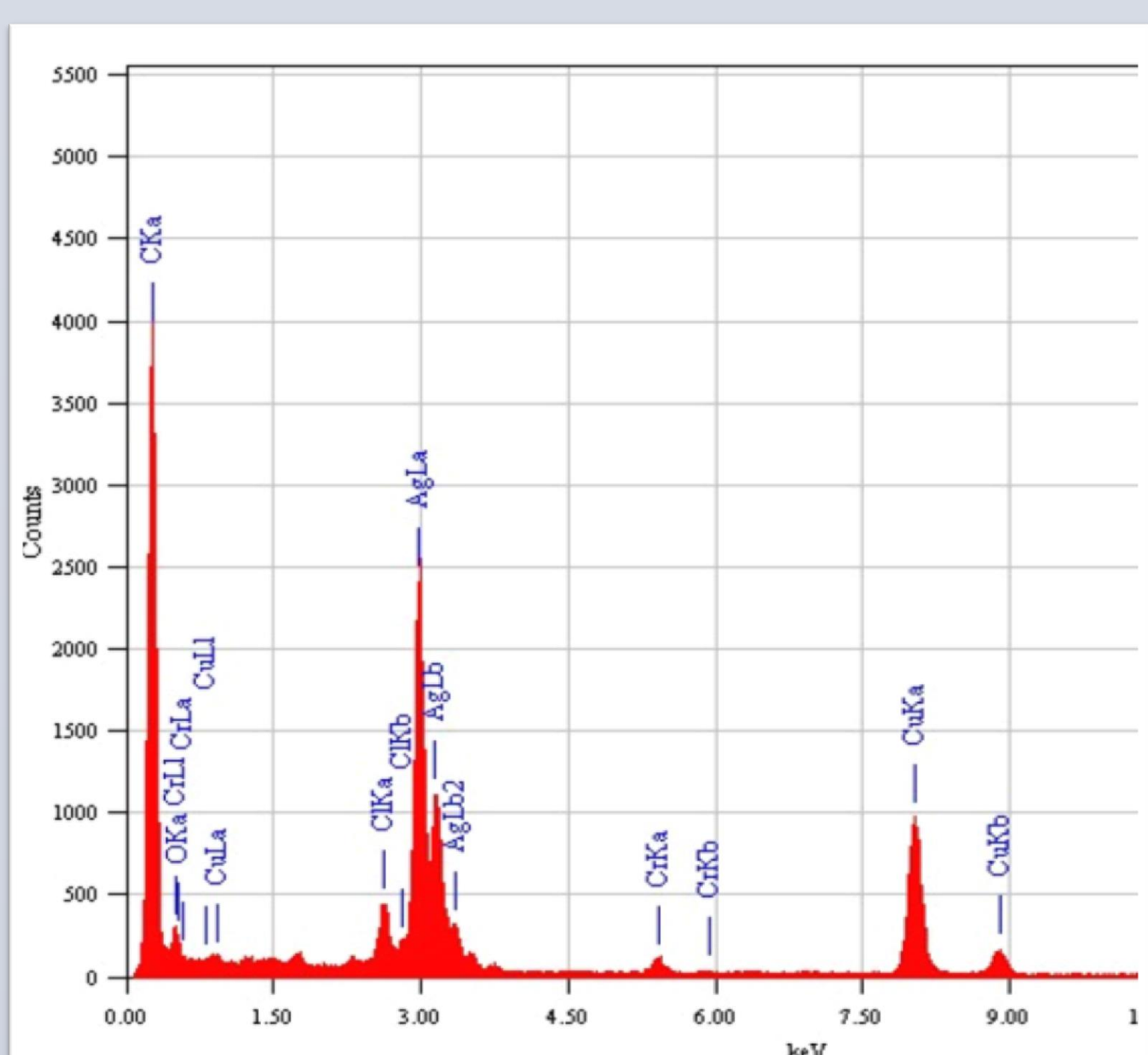


Figure-4: Energy dispersive x-ray analysis (EDX spectrum).

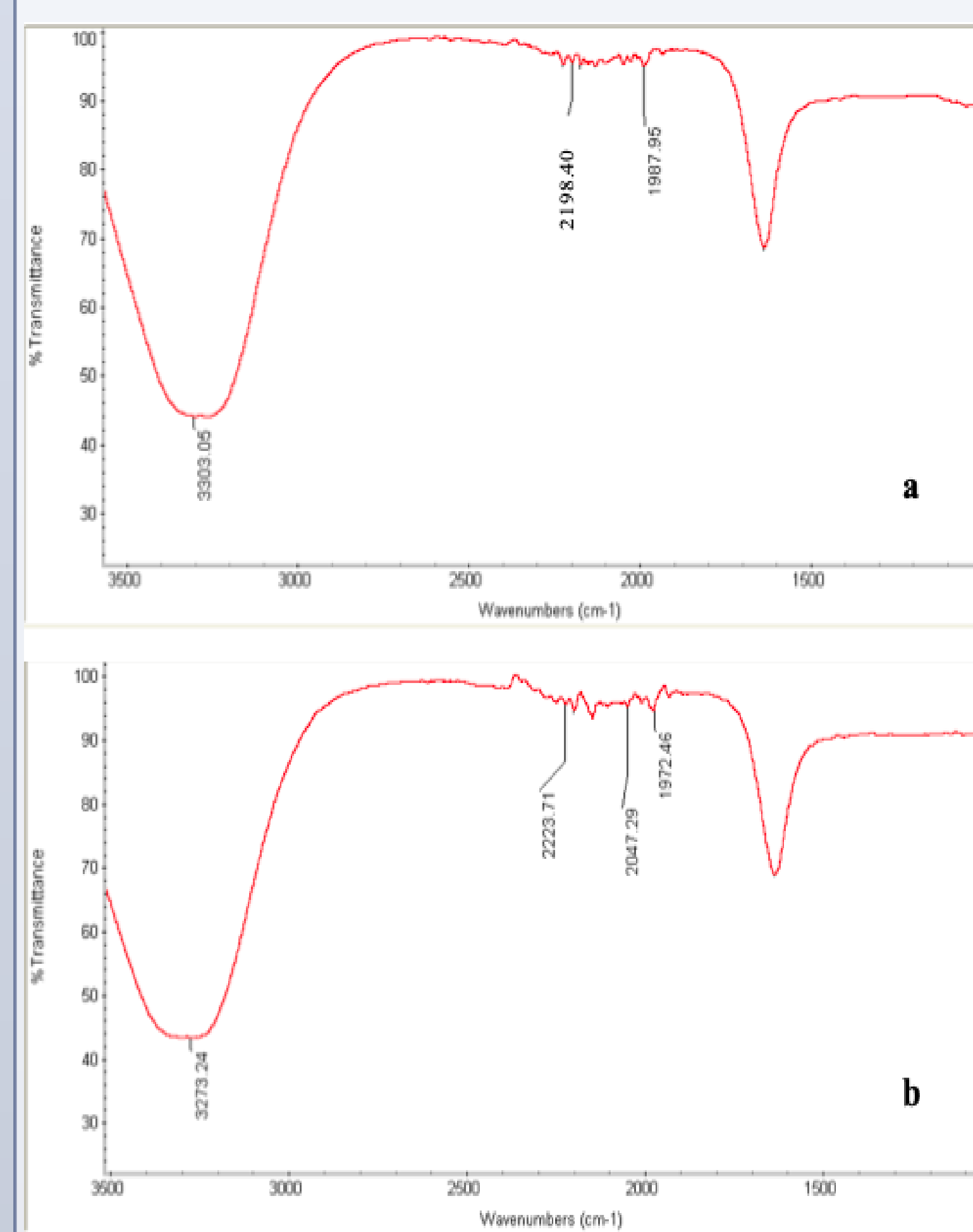


Figure-5: Fourier-transform infrared spectroscopy analysis peaks, (a) LPE, (b) AgNPs synthesized from LPE.

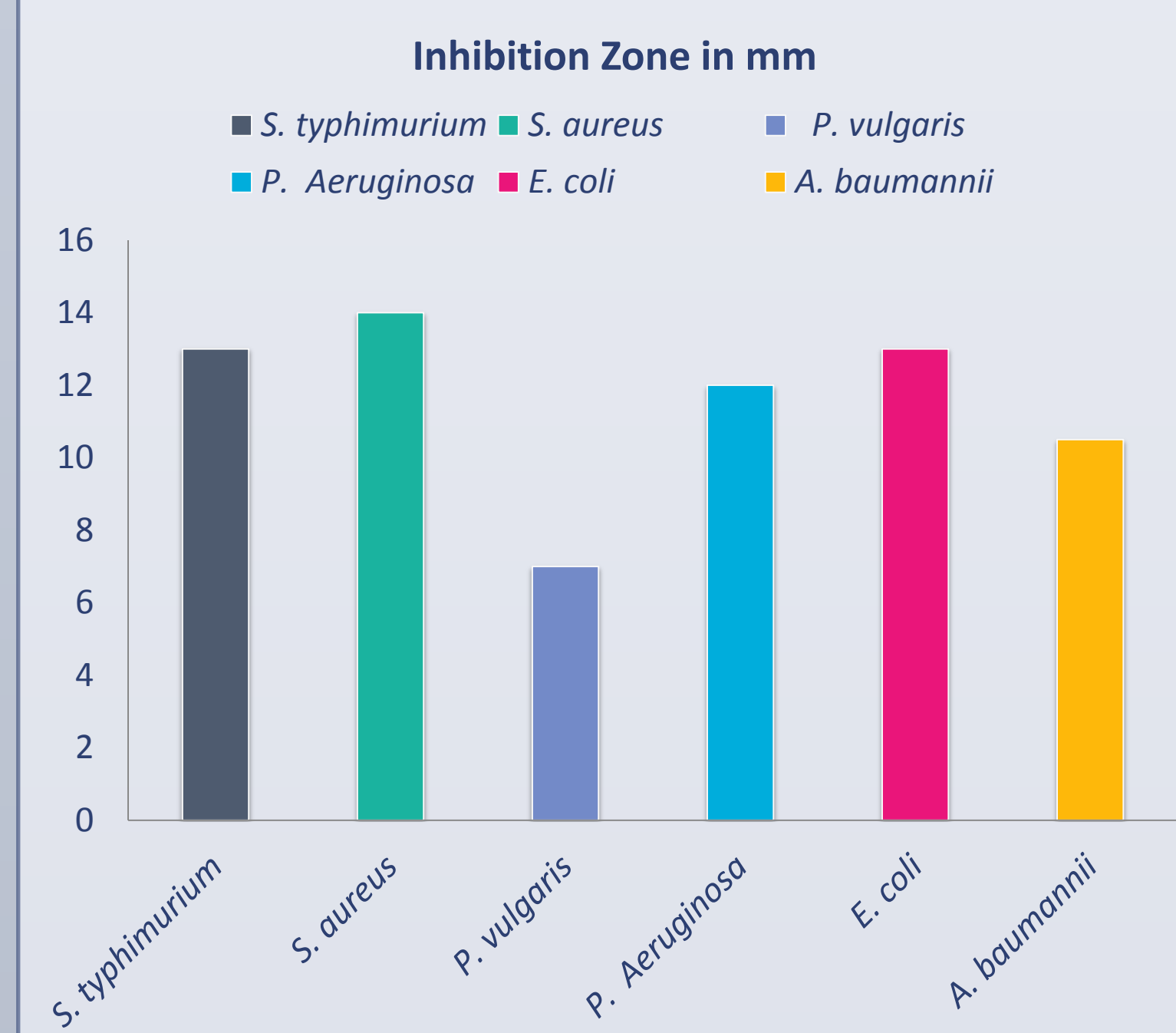


Chart-1: Antibacterial activity of the green synthesized AgNPs.

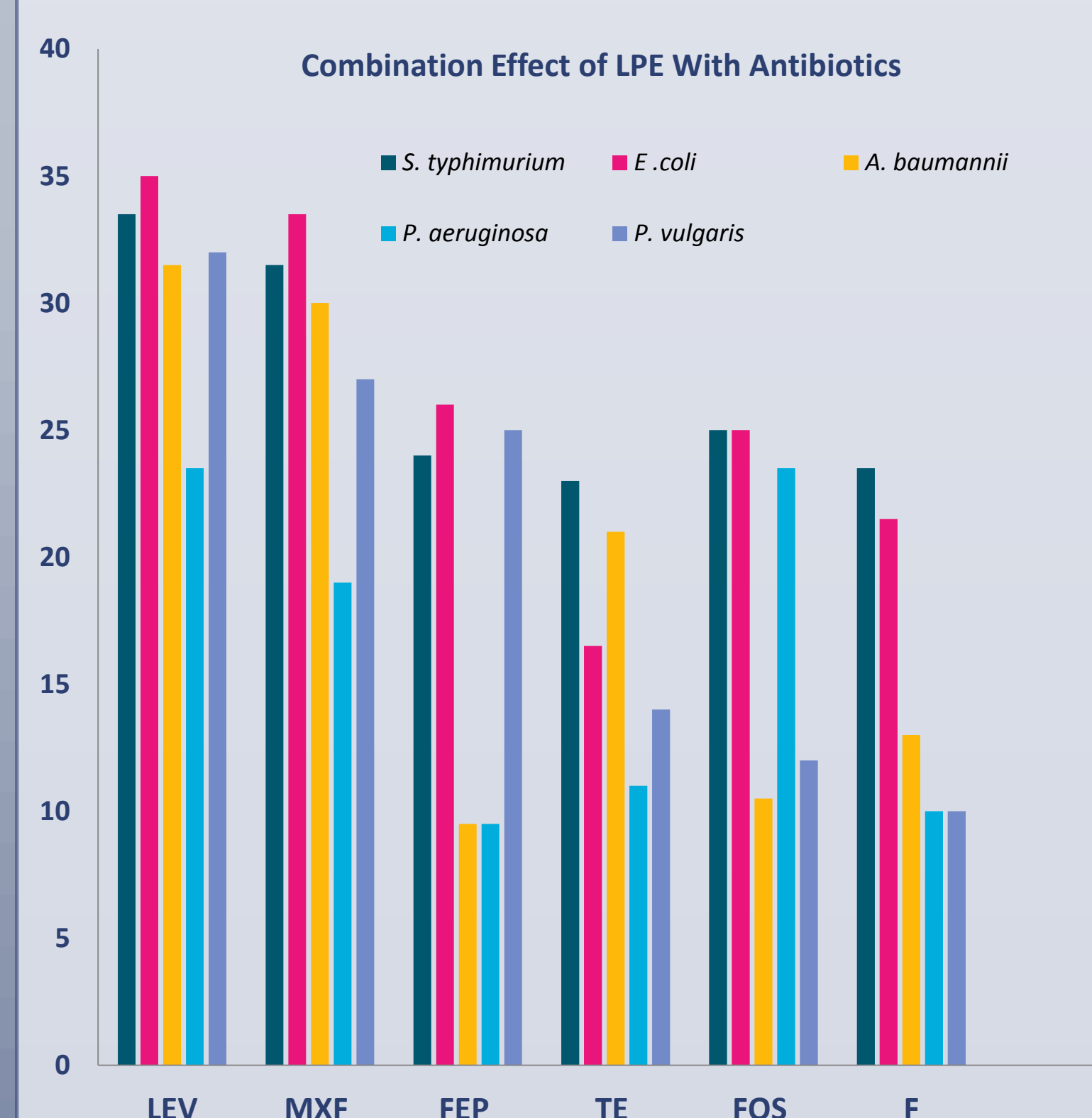


Chart-2: Combination effect of the green synthesized AgNPs with different antibiotics on g- bacteria.

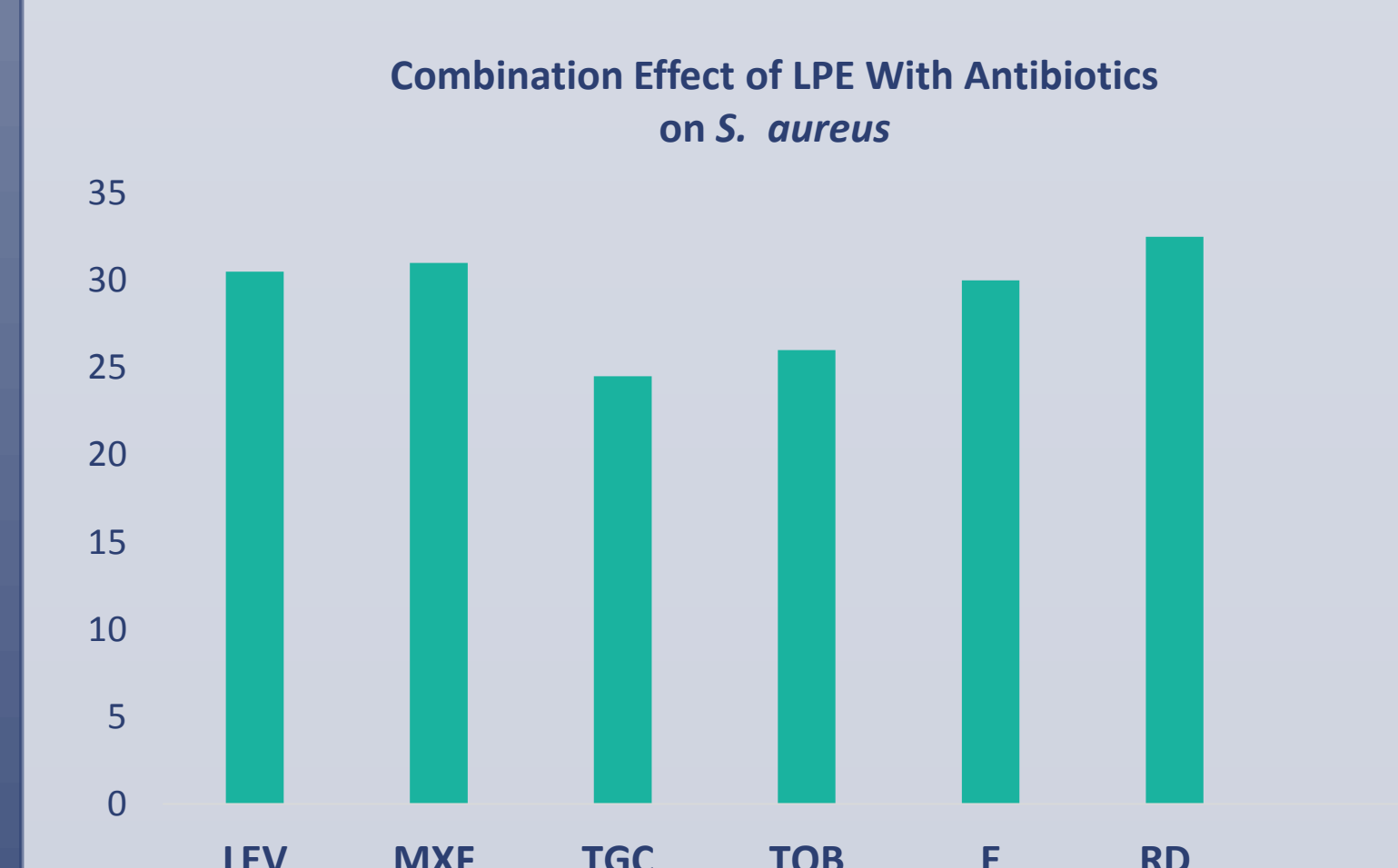


Chart-3: Combination effect of the green synthesized AgNPs with different antibiotics on *S. aureus*.

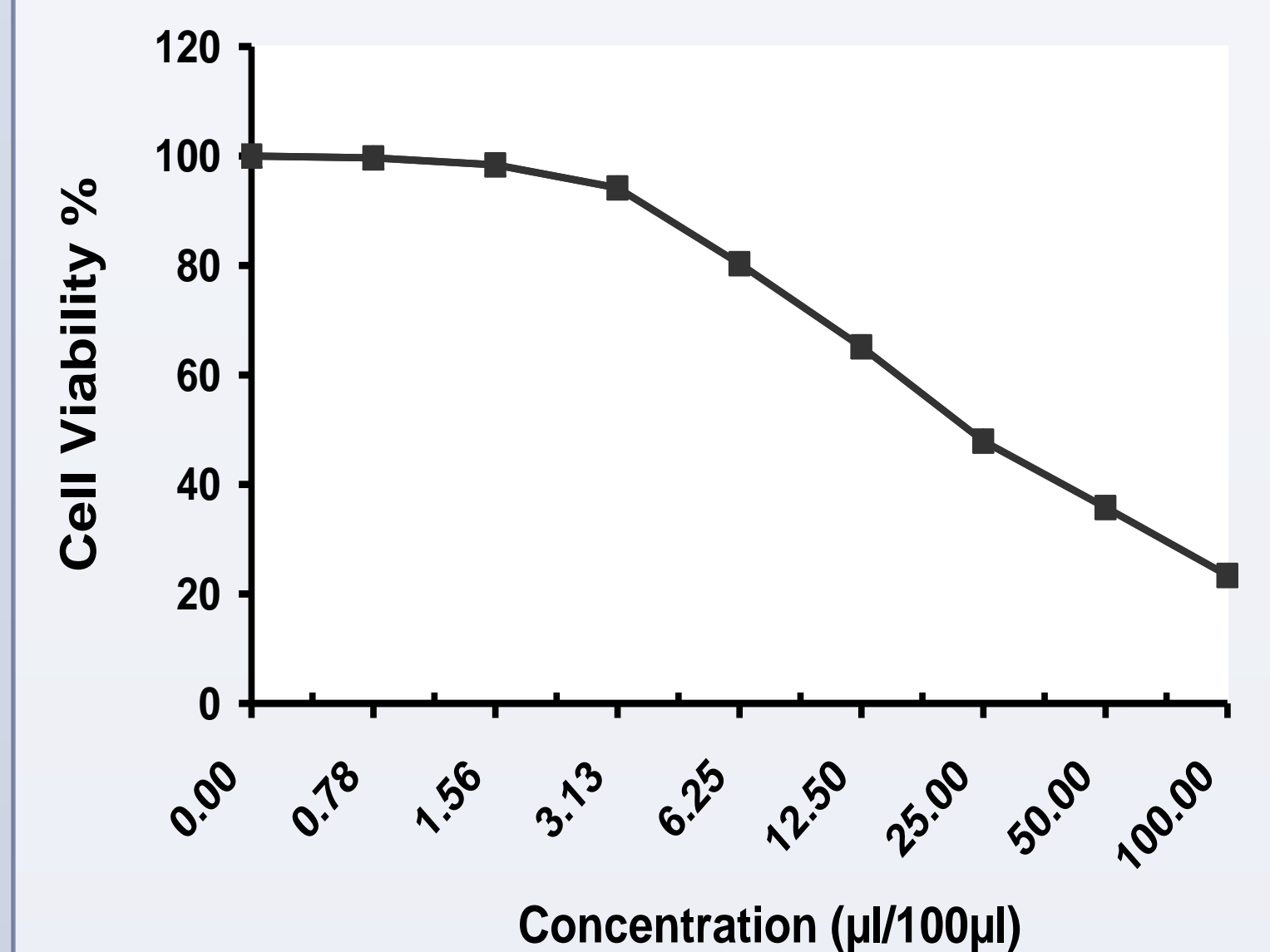


Figure-6: Cytotoxic activity of AgNPs on MCF-7, with an IC₅₀ of 23.5 ± 0.97 µl/100µl.

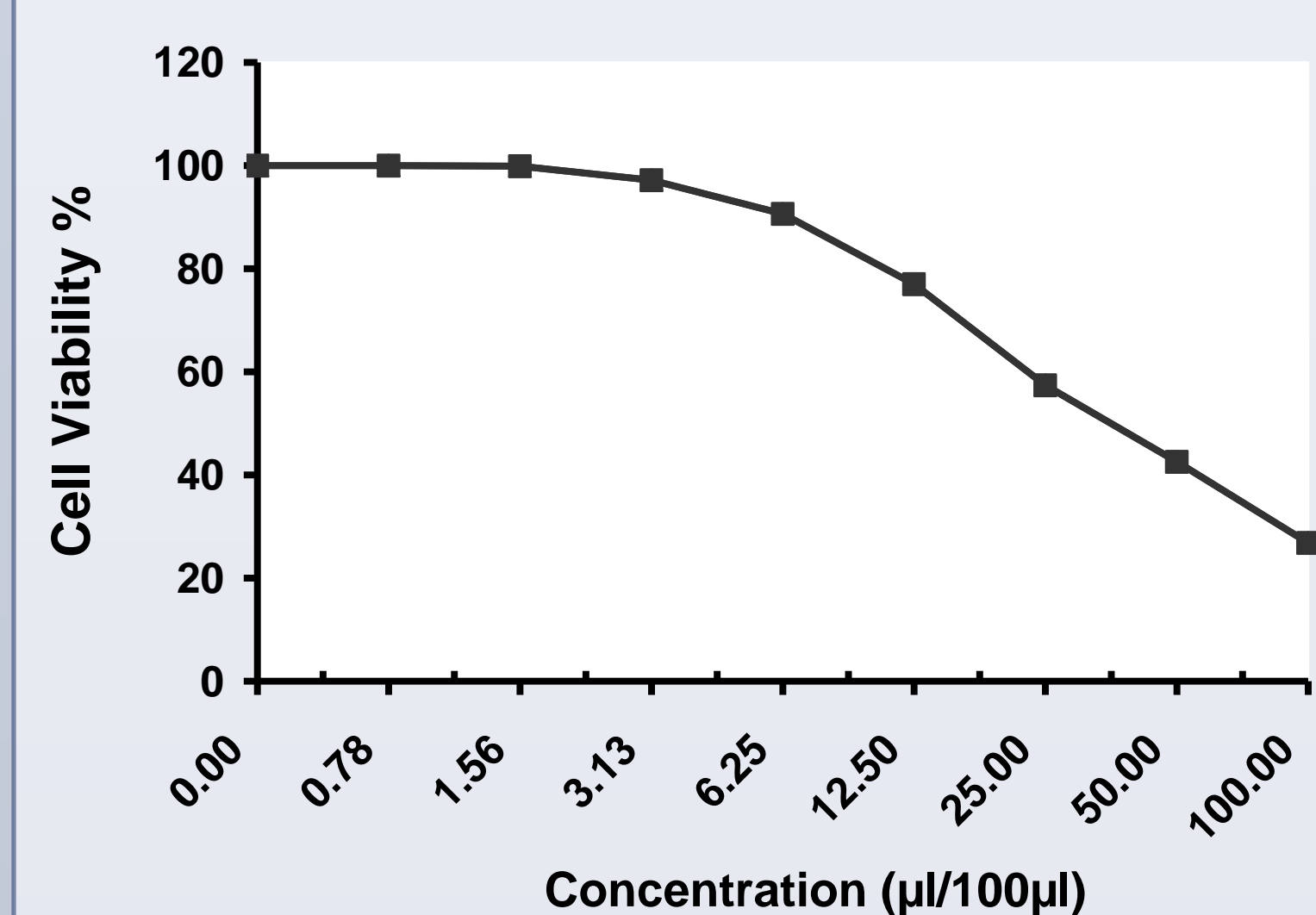


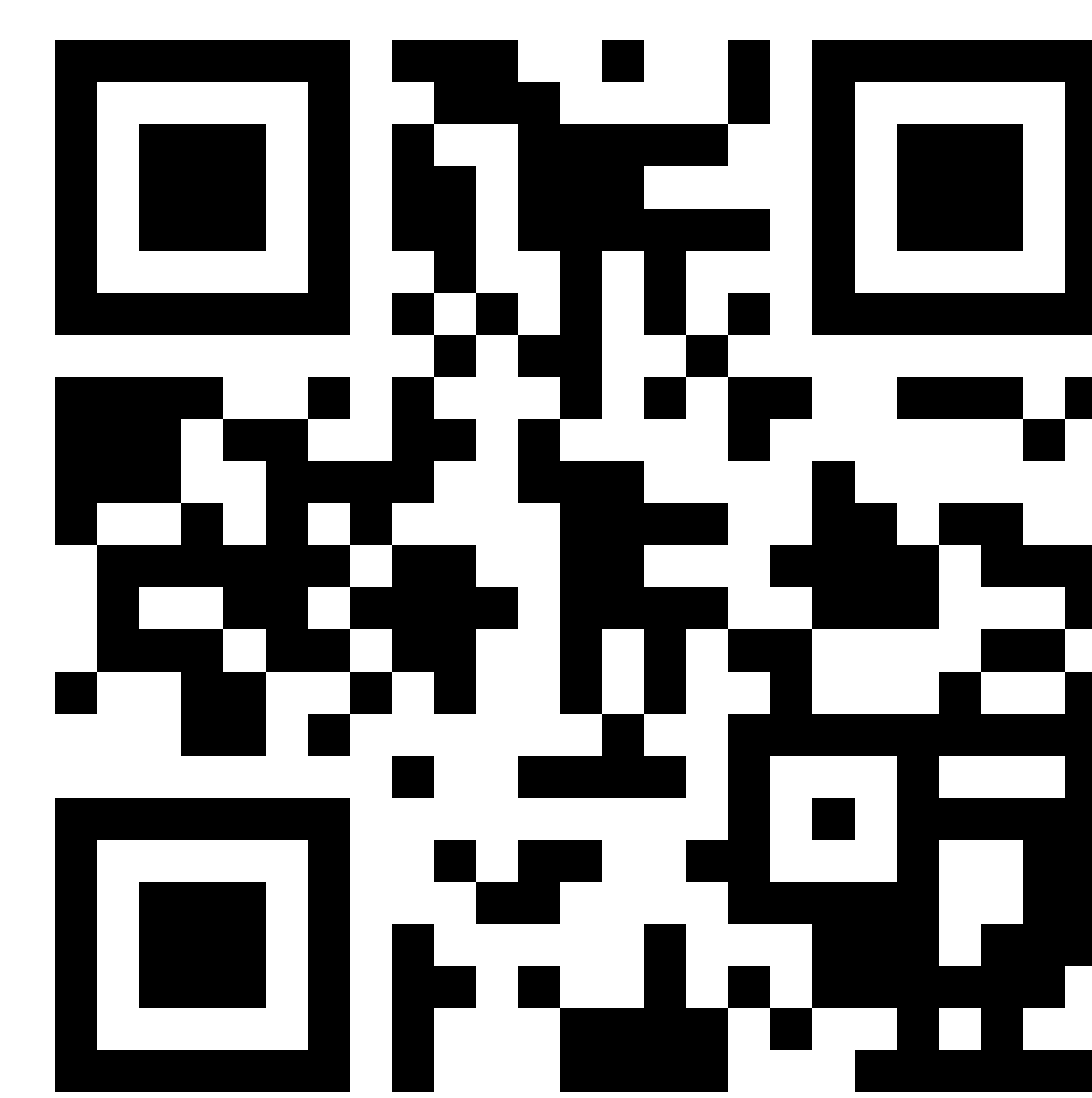
Figure-7: Cytotoxic activity of AgNPs on HCT-116 with an IC₅₀ of 37.48 ± 5.93 µl/100µl.

CONCLUSION & RECOMMENDATION

To conclude, silver nanoparticles synthesized using the LPE showed the best antibacterial effect particularly on *S. aureus*. Yet when combining the AgNPs with the antibiotics, an enhanced and decreased inhibition zone size was observed. Moreover, the cytotoxic effect of the AgNPs showed the best activity against MCF-7 cell lines.

In the future, we recommend optimizing the conditions when green synthesizing silver nanoparticles, as well as understanding the mode of action and determining the toxic effects on animals, in order to employ the AgNPs in the field of medicine as a possible therapeutic agent.

REFERENCES



Acknowledgements

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