



وزارة التعليم العالي والبحث العلمي  
جامعة ميسان  
كلية التربية الاساسية

Ministry of Higher Education and Scientific  
Research  
University of Misan  
College of Basic Education

Misan Journal for Academic Studies  
Humanities, social and applied sciences

# مجلة ميسان للدراسات الأكاديمية

العلوم الانسانية والاجتماعية والتطبيقية

ISSN (Print) 1994-697X

(Online)-2706-722X

المجلد 24 العدد 53 اذار 2025

Mar 2025 Issue53 VOL24



مجلة ميسان للدراسات الاكاديمية

العلوم الإنسانية والاجتماعية والتطبيقية

كلية التربية الأساسية / جامعة ميسان / العراق

**Misan Journal for Academic Studies**

**Humanities, social and applied sciences**

**College of Basic Education/University of Misan/Inq**

ISSN (Print) 1994-697X (Online) 2706-722X

|      |      |          |           |
|------|------|----------|-----------|
| 2025 | اذار | العدد 53 | المجلد 24 |
| 2025 | Mar  | Issue53  | VOL24     |



OJS / PKP  
[www.misan-jas.com](http://www.misan-jas.com)

**IRAQI**  
Academic Scientific Journals



ORCID

OPEN ACCESS



 [journal.m.academy@uomisan.edu.iq](mailto:journal.m.academy@uomisan.edu.iq)

رقم الابداع في دار الكتب والوثائق بغداد 1326 في 2009

| الصفحة    | فهرس البحوث                                                                                                                                                                                                                                    | ت  |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 14 - 1    | <b>Evaluation of anti-plaque and anti-inflammatory efficacies of mouth rinse containing green tea and <i>Salvadora Persica L.</i> in the management of dental biofilm-induced gingivitis</b><br>Aliaa Saeed Salman      Maha Abdul Azeez Ahmed | 1  |
| 26 - 15   | <b>Evaluation of galectin-3 and peptidyl arginine deiminase-4 levels in saliva for periodontal health, gingivitis and periodontitis</b><br>Yusur Ali Abdulrazzaq      Alaa Omran Ali                                                           | 2  |
| 37 - 27   | <b>EFFECT OF HYPOCHLOROUS ACID ON SURFACE ROUGHNESS AND WETTABILITY OF ZINC OXIDE EUOGENOL IMPRESSION PASTE</b><br>Israa J.Taha      Shorouq M. Abass                                                                                          | 3  |
| 47 - 38   | <b>Annual groundwater recharge estimation in Nineveh plain, northern Iraq using Chloride Mass Balance (CMB) method</b><br>Fatima AJ. Abdul Wahab      Alaa M. Al-Abadi                                                                         | 4  |
| 61 - 48   | <b>A Theoretical Study for Excitation of Electrons Collides with Positive Nitrogen Ions</b><br>Hawraa S. Kadhim      Alaa A. Khalaf                                                                                                            | 5  |
| 72 - 62   | <b>Green synthesis of gold nanoparticles (AuNPs) using pathogenic bacteria <i>Acinetobacter baumannii</i> with evaluation their antibacterial activity</b><br>Hawraa Khalaf Abbood      Rashid Rahim Hateet                                    | 6  |
| 82 - 73   | <b>Structural, Optical and Gas Sensor Properties of Zinc Oxide Nanostructured thin films prepared by Chemical Spray Pyrolysis</b><br>Ameer I. Khudadad      Ezzulddin Abdoulsahib Eesee                                                        | 7  |
| 91 - 83   | <b>Soft denture liner and its additives (A review of literature)</b><br>Ibrahim Ali Al-Najati      Ghasak Husham Jani                                                                                                                          | 8  |
| 103 - 92  | <b>A Critical Discourse Analysis of the Language of Persuasion in Political Discourse</b><br>Mohammed Hussein Hlail                                                                                                                            | 9  |
| 116 - 104 | <b>A Comprehensive Review of Rice Husk Derived Silica As Nano Filler (A review of literature)</b><br>Azza Walaaldeen Khairi      Huda jaafar naser                                                                                             | 10 |
| 125 - 117 | <b>Evaluation of Superoxide Dismutase and their association with Diabetic neruopathy and Heart disease in Iraq populations</b><br>Zainab A. Salman                                                                                             | 11 |
| 139 - 126 | <b>Schema Theory in Sarah Moss's "The Fell": A Cognitive Stylistic Study</b><br>Salah R. Al-Saed      Nazar Abdul Hafidh Abeid                                                                                                                 | 12 |
| 149 - 140 | <b>Validation and Development of UV spectroscopy method for the Estimation of Diclofenac sodium in Bulk and dos protected mode interface</b><br>Mohammed R . Abdul - Azeez                                                                     | 13 |
| 167 - 150 | <b>Using A Genetic Algorithm to Solve the Inventory Model with A Practical Application</b><br>Ahmed Jamal Mohammed Al-Botani      Faris Mahdi Alwan Al-Rubaie                                                                                  | 14 |
| 180 - 168 | <b>Seasonal Variatins of Polychlorinted Biphenyls compounds in Water of Tigris River , Maysan Province / Iraq</b><br>Halima Bahar Kazem      and Salih Hassan Jazza                                                                            | 15 |

|                  |                                                                                                                                                                                                                              |           |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>200 - 181</b> | <b>The Reasons Behind the Societal Reversal on the Governance of Amir al-Mumineen After the Prophet's Death (Peace (PBUH)) Through the Sermons of Lady Fatima al-Zahra (Peace Be Upon Her)</b><br>Fatima Abd Saeed Al-Maliki | <b>16</b> |
| <b>217 - 201</b> | <b>The place and its Implications in Adghat Madinah novel "</b><br>Saja Jasim Mohammed Assistant Instuctor                                                                                                                   | <b>17</b> |
| <b>233 - 218</b> | <b>The Level of Strategic Thinking Among School Principals in the Center of Misan Governorate from the Perspective of Their Teachers</b><br>Multaka Nasser Jabbar                                                            | <b>18</b> |
| <b>253 - 234</b> | <b>The reality of the practice of Arabic language teachers in the primary stage of reciprocal teaching from the perspective of the specialty supervisors</b><br>Khadija Najm Abdel Qader      Ramla Jabbar Kazem             | <b>19</b> |
| <b>274 - 254</b> | <b>Optimal storage model to sustain the operation of Baghdad stations Establish an</b><br>Faris Mahdi Alwan      Ahmed Ali Mohammed                                                                                          | <b>20</b> |
| <b>284 - 275</b> | <b>Poetry on the tongue of the other, a media vision. The poetry of Abu Marwan al-Jaziri (396 AH) is an example</b><br>Sabreen Khalaf Hussein                                                                                | <b>21</b> |
| <b>297 - 285</b> | <b>Saudi-Japanese relations1938-1973(historical study</b><br>Ali Joudah Sabih Al-Maliki      Faraged Dawood Salman Al-Shallal                                                                                                | <b>22</b> |
| <b>313 - 298</b> | <b>Influences on Al-Asma'i's Critical Judgment (A Critical Study)</b><br>Hussam Kadhim Atiyah                                                                                                                                | <b>23</b> |
| <b>334 - 314</b> | <b>The Effect of Felder and Silverman's Model in the Achievement of Fifth High School Female Students and Their Lateral Thinking in Mathematics.</b><br>Shaymaa Kareem Hassoon                                               | <b>24</b> |
| <b>344 – 335</b> | <b>Enzymatic Activity of Fungi Isolated From the Bases of Stems and Roots of Faba Bean Plants Infected with Root Rot Disease</b><br>Asia N Kadim      Ali A Kasim      Ghassan Mahdi Daghir                                  | <b>25</b> |
| <b>364 - 345</b> | <b>Alternative Means for Resolving Disputes Arising from Trading in the Securities Market (A Comparative study)</b><br>Saja Majed Daoowd                                                                                     | <b>26</b> |



...

ISSN (Print) 1994-697X  
ISSN (Online) 2706-722X

DOI:  
<https://doi.org/10.54633/2333-024-053-006>

Received:13/12/2024  
Accepted:19/1/2025  
Published online:13/3/2025



## Green synthesis of gold nanoparticles (AuNPs) using pathogenic bacteria *Acinetobacter baumannii* with evaluation their antibacterial activity

<sup>1</sup>Hawraa Khalaf Abbood, <sup>2</sup>Rashid Rahim Hateet

<sup>1,2</sup>Department of Biology, College of Science, University of Misan/ Iraq

<sup>1</sup>[ggaaww2710@gmail.com](mailto:ggaaww2710@gmail.com)

[https:// orcid.org/ 0009-0002-8688-1816](https://orcid.org/0009-0002-8688-1816)

<sup>2</sup>[biorashed@uomisan.edu.iq](mailto:biorashed@uomisan.edu.iq)

### Abstract:

The current study concentrated on the environmentally friendly production of gold nanoparticles (AuNPs) by pathogenic bacteria, specifically *Acinetobacter baumannii*, that were isolated from blood. By monitoring the color change of the reaction mixture Tetrachloroauric acid (HAuCl<sub>4</sub>.3H<sub>2</sub>O + bacterial filtrate), the production of AuNPs was verified following isolation and molecular identification. Physicochemical tests were used to evaluate the produced AuNPs. The results showed that the particles had a UV spectroscopic peak at a wavelength of 560 nm and that their spherical size ranged from 91 to 43 nm when viewed under a scanning electron microscope Fe-SEM. The chemical components in the bacterial extract have a fundamental impact on the formation of AuNPs as a bioreducing agent, according to the infrared spectrum obtained using the FTIR technique. According to the XRD analysis, the NPs exhibit a cubic crystalline structure, and the EDX-Mapping analysis verified the presence of gold. Furthermore, the antibacterial efficacy of AuNPs against two strains of Gram-positive *Staphylococcus aureus* and Gram-negative *Echerichia coli* pathogenic bacteria was confirmed using inhibitory diameters (24 mm and 22 mm) based on the antibiotic gentamicin. with diameter (20mm) as a control at a concentration of 1000 mg/mol as the results showed that the particles have good antibacterial activity

**Keywords:** AuNPs, Antibacterial, *Acinetobacter baumannii*, XRD, FTIR

### Introduction:

Nanotechnology is the process of developing and building nanostructured materials for a range of applications (Shah *et al.*, 2021). The nanoparticles exhibit unique physical, chemical, and biological properties at the nanoscale as opposed to their counterparts at greater dimensions. NPs differ from bulk metals in their chemical and physical characteristics, such as their greater specific surface areas, lower melting temperatures, and specific magnetizations. These differences may make NPs appealing for a variety of industrial applications (Horikoshi & Serpone, 2013). The synthesis of NPs is categorized into two classes, namely "top down" and "bottom-up" based on the way of NPs formation (Ijaz *et al.*, 2020). There are several methods of NPs synthesis including physical, chemical and biological method.

The utilization of biological and green technologies to manufacture different NPs is becoming more and more popular among the many synthetic methods for NP preparation (Khan *et al.*,2022). Because the process can be modified by varying the culture factors, including nutrition, pH, pressure, and temperature, bacteria, yeast, and fungus are used in the environmentally friendly creation of NPs (Yadav *et al.*,2023). The intracellular and extracellular techniques are the two approaches for NP synthesis where extracellular and intracellular material produced by bacteria serves as a reducing agent when combined with Ag or Au solution to create NPs (Qamar *et al.*,2021). Over the past few decades, gold nanoparticles (AuNPs) have drawn a lot of attention and their properties have been studied in a variety of fields, including biology, physical and chemistry (Sadiq *et al.*,2024). In a recent work, Srinath and Rai demonstrated how the bacteria *Enterobacter aerogenes* produces pure AuNPs (Srinath & Rai,2015). One of the most significant nosocomial pathogens, *Acinetobacter baumannii*, can cause infections such meningitis, pneumonia, urinary tract infections, septicemia, and wound infections (Dehbanipour & Ghalavand,2022).As resistant strains and their infections increase, there is an inevitable need for a new antibacterial agent that is inexpensive, has few side effects, and is strong (Hosseini *et al.*,2016).When Rajan *et al.* examined the antibacterial properties of AuNPs made by *Elettaria cardamomum*, they found that the generated AuNPs were more effective against *S. aureus* than against *E. coli* and *P. aeruginosa* (Rajan *et al.*,2017). The current study addressed two objectives: firstly is the biosynthesis of AuNPs by one of the pathogenic bacterial isolates *Acinetobacter baumannii* with some physicochemical tests. The second is to verify the ability of AuNPs to inhibit bacterial cells to replace antibacterial agent.

## Material and method:

### 1-Collection and isolation of Bacteria:

One bacterium was isolated from blood in this investigation. The polymerase chain reaction (PCR) method was used to molecularly diagnose the samples, which were taken from the Children and Maternity Hospital laboratory in Maysan, Iraq. According to (Al-Naqshbandi *et al.*,2019), the separation technique was.

### 2-Moleculer identification of bacteria:

Numerous methods have used a universal primer (Table 1) to ascertain the DNA sequence of the material (Macrogen/Korea).Genomic DNA was isolated from isolates using a DNA kit (Presto' Mini g DNA Bacteria Kit, Geneaid, Taiwan) (Hassan *et al.*, 2022). The isolated strain was genotypically identified using 16s rRNA sequencing analysis, and the outcomes were compared with NCBI GenBank (Ibrahim *et al.*, 2019).

**Table (1) Primer kite that used in study**

| No | Gene      | Primers Sequence          | Product size<br>Annaling temp. |
|----|-----------|---------------------------|--------------------------------|
| 1  | 16 S rRNA | F- AGAGTTTGATCMTGGCTCAG   | 1500 bp<br>56 C                |
|    |           | R- TACGGYTACCTTGTTACGACTT |                                |

### 3-Biosynthesis of AuNPs:

For the creation of NPs, the centrifuged supernatant was utilized. In order to create AuNPs, 50 ml of hydrogen tetrachloroaurate (HAuCl<sub>4</sub>) at concentrations of 2 mM was mixed with 100 ml of supernatant, and the mixture was then incubated at 37 °C. The same experimental conditions were used to incubate a cell control that did not contain the gold salt.

### 4-Study physical characterization of the bio-synthesized AuNPs:

The biosynthesis nanoparticles' physicochemical characteristics were investigated by a series of tests, including FTIR, UV, Fe-SEM, EDX-mapping, and XRD.

### 5-Testing anti-bacterial activity of bio-synthesized AuNPs:

Gram-positive *S.aureus* and gram-negative *E.coli* were both tested for antibacterial activity using the disc diffusion method. These bacteria were separated from harmful bacteria that VITik-2 detected at the Child and Martinty Hospital in Misan, Iraq. Pure bacterial colonies were cultured for 24 hours at 37°C on nutrient agar, and the turbidity was brought down to the (0.5) McFarland standard using D.W. sterile distilled water. Following equal swabbing of each species of bacteria onto MHA plates, AuNP discs were added. Plates were then incubated. Using gentamicin at a concentration of 1000 mg/mol as a reference, petri dishes were assessed for the inhibitory zone measure in millimeters (mm) following incubation for 24 hours at 37°C (Malathi & Palani, 2019)

## Results and Discussion:

### 1-Molecular identification of bacteria

The polymerase chain reaction approach showed that the primers amplified the gene sequence after the DNA pathogenic bacteria isolate from blood were extracted, and that the amplified bands emerged between 1000 and 1500 pb Fig 1

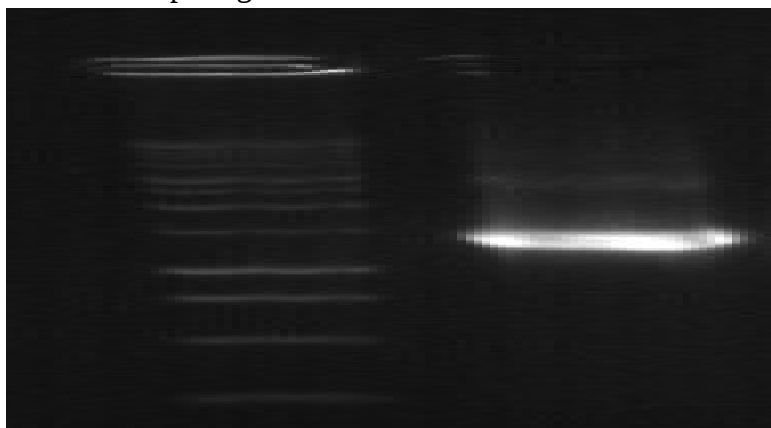


Fig (1) Electrophoresis on agarose gel of the PCR product using primers

### 2-Biosynthesis of AuNPs:

Observing the color change of *A. baumannii* supernatant treated with (HAuCl<sub>4</sub>) solution served as the initial confirmation of the biosynthesis of AuNPs. Following 48 hours of incubation at 37°C, a time-dependent color change was seen in the supernatant, as seen in Fig (2). The supernatant's color changed from pale yellow to dark red with time, primarily as a result of the AuNPs surface plasmon (SPR) vibrations being excited. This indicates that the bacteria and its protein alone were responsible for the biosynthesis of AuNPs (Srivastava & Mukhopadhyay, 2013).



Fig (2) color chang of supernatant a) without salt b) with salt for AuNPs produced by *A. baumannii*

### 3-Study physical characterization of the bio-synthesized AuNPs:

The peaks at 560 nm wavelength confirmed the production of AuNPs synthesized from *A. baumannii* after incubation for 24 h Fig (3), as the study (Srinath & Rai,2015) showed the surface plasmon resonance (SPR) of AuNPs usually ranges from 510 to 560 nm. where the UV spectrum of AuNPs synthesized from *Enterobacter aerogenes* filtrate was determined at a peak of 540 nm

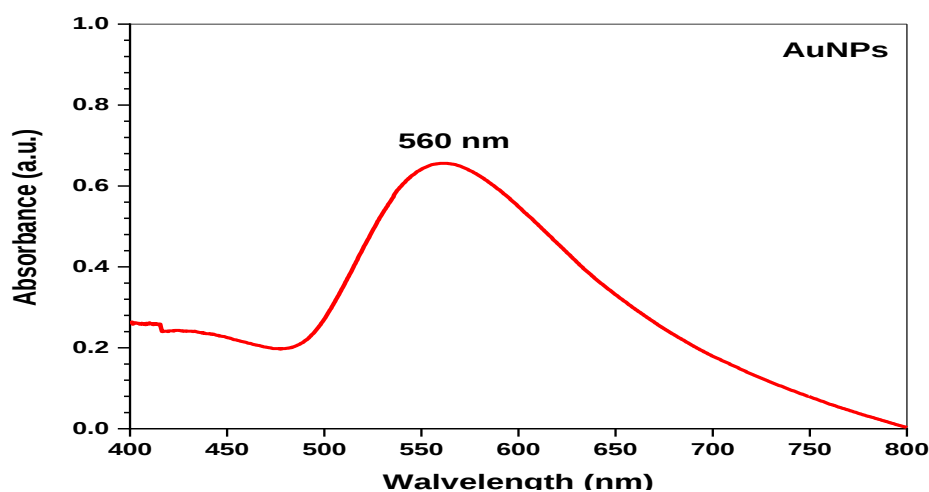


Figure (3) UV-Vis spectroscopy of AuNPs synthesized by *A. baumannii*

Here, FTIR spectroscopy was used to find the bands and functional groups that provide NPs with a unique identity. The table (2) shows the presence of fuctional groups at the indicated peaks. Fig (4) showed FTIR peaks of AuNPs. These findings might point to the role that proteins and other molecules play in the stability of nanoparticles and the bioreduction process (Sirisha *et al.*,2017) (Alfryyan *et al.*, 2022) revealed these results may the contribution of proteins and other molecules in the bio-reduction process and the stability of NPs.

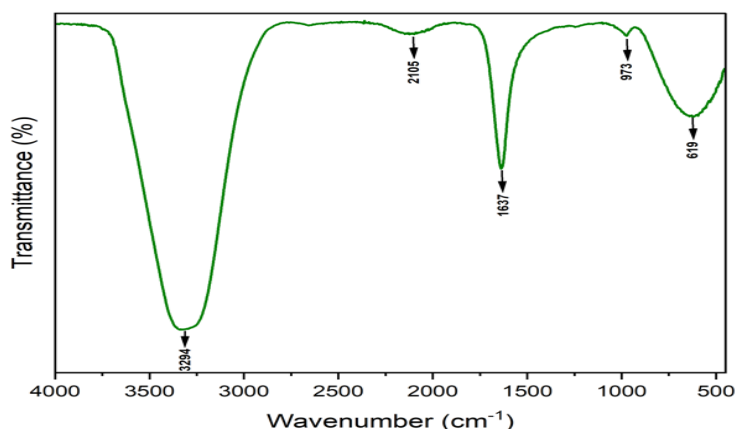


Fig (4) FTIR analysis of AuNPs produced by *A. baumannii*

Table (2) The various bands and Functional groups of AuNPs

| AuNPs wavenumber( $\text{cm}^{-1}$ ) | Bands | Functional group        |
|--------------------------------------|-------|-------------------------|
| 3294                                 | N-H   | Aliphatic primary amine |
| 2105                                 | N=C=S | Isothiocyanate          |
| 1637                                 | C=C   | Alkene                  |

Fig (5) shows Fe-SEM images of AuNPs synthesized from *A. baumannii* filtrate with a spherical shape and a scale bar of 500 nm and different sizes ranging from (43-91nm) and an average of 68nm Fig (6). The outcomes of a prior work demonstrated the successful synthesis of AuNPs with a spherical morphology, where the bio-synthesised AuNPs are homogeneous, uniform, and well-dispersed. Additionally, a propensity for aggregation is noted for artificial NPs while their size were ranged 10-50nm (Chang *et al.*,2021)

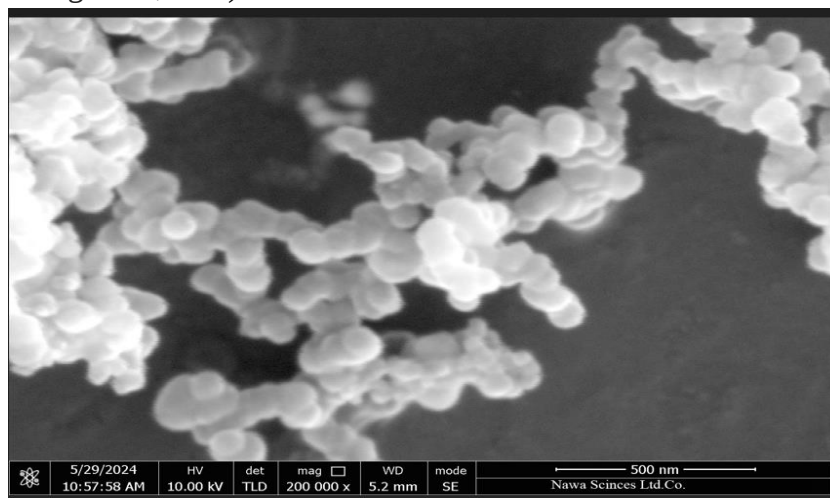
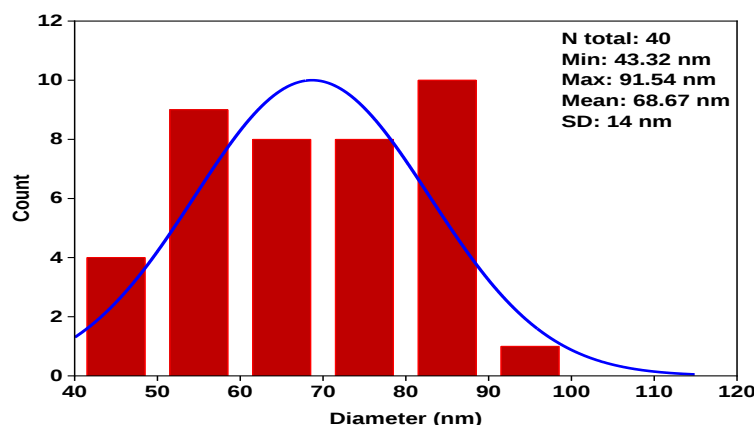
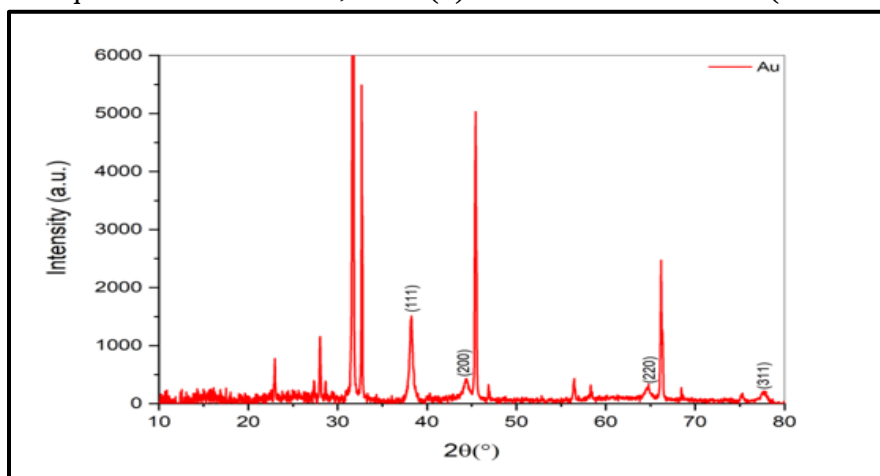


Fig (5) Fe-SEM image of AuNPs Produced by *A. baumannii*



**Fig (6) The histogram of the size distribution of AuNPs Produced by *A. baumannii***

Fig (7) shows the XRD spectrum of AuNPs created from the filtrate *A. baumannii* four Bragg reflections (111) (200) (220) (311) at a value of 2 theta for angles (38) (44) (64) (77) respectively, referring to JCPDS data file No. 00-004-0784 as a standard reference for AuNPs, indicating that they are particles. The crystalline nature tends to have a cubic structure and the average particle size using the Debye-Schwarr equation was 22.6 nm, Table (3). This is consistent with (Sunderam *et al.*, 2019)



**Fig (7) XRD analysis of AuNPs produced by *A. baumannii***

**Table (3) Debye-Schwarr equation of AuNPs**

| 2 theta   | theta (deg) | thata (rad) | Cos theta  | FWHM (β) (deg) | FWHM (rad)  | D        |
|-----------|-------------|-------------|------------|----------------|-------------|----------|
| 38.236    | 19.11801    | 0.33350306  | 0.9449014  | 0.25584        | 0.004462987 | 32.86633 |
| 44.357    | 22.1785     | 0.38689161  | 0.92608636 | 0.374804       | 0.006538248 | 22.89024 |
| 64.676    | 32.338175   | 0.5641215   | 0.84505864 | 0.51168        | 0.008925973 | 18.37472 |
| 77.549    | 38.774375   | 0.67639743  | 0.77983294 | 0.614016       | 0.010711168 | 16.593   |
| D-average |             |             |            |                |             | 22.6811  |

The presence of an elemental gold was confirmed during AuNPs by EDS analysis . The peaks in Fig (8) can be attributed to the chemicals found in the bacterial extracts, and the signals (oxygen, carbon, silicon, chloride, etc.) may have originated from organic biomolecules or phenolic compounds on the nanoparticle surface (Hatipoğlu,2021). Fig (9) displays AuNPs' EDX-Mapping images, which display a map of the atom distribution for each NP element.

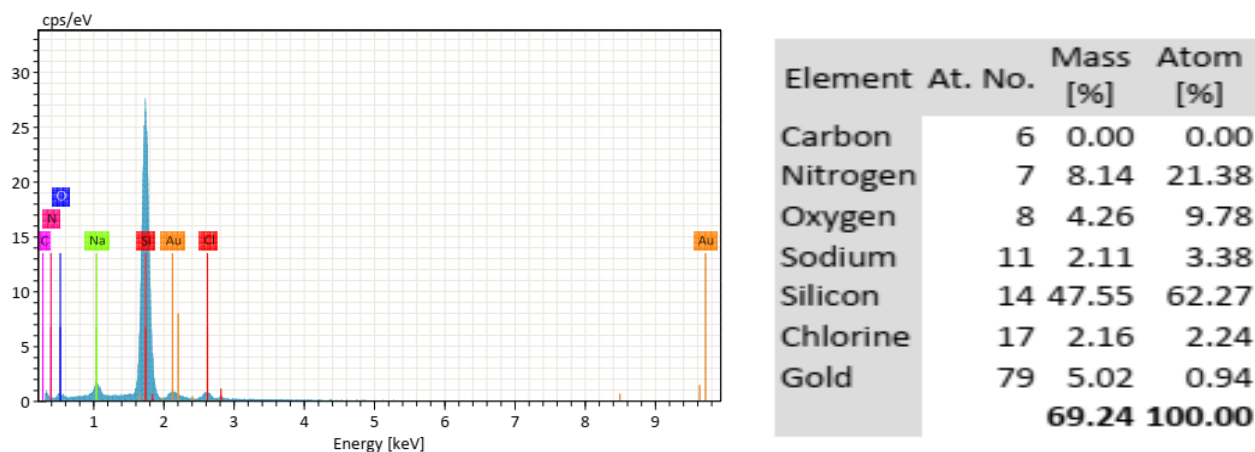


Fig (8) EDX analysis of AuNPs produced by *A. baumannii*

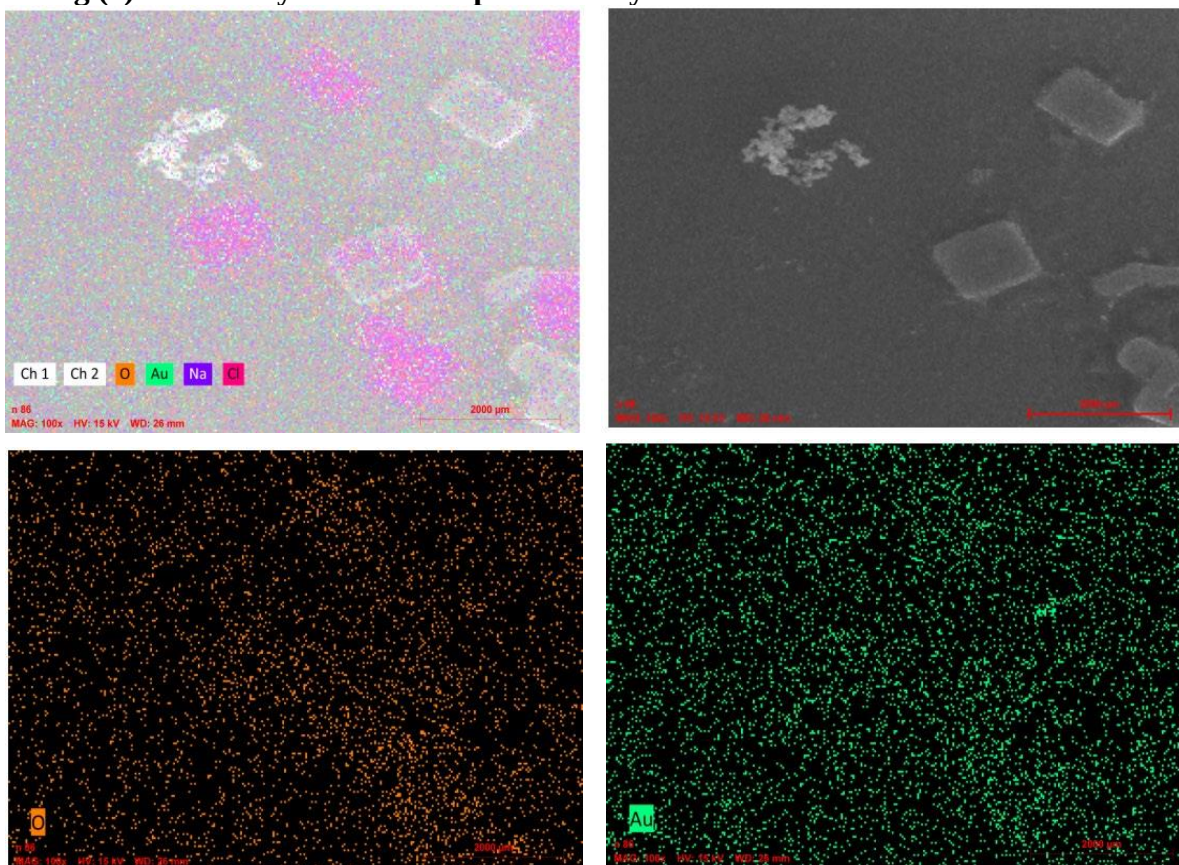


Fig (9) EDX-Mapping image of AuNPs produced by *A. baumannii*

#### 4-Testing anti-bacterial activity of bio-synthesized AuNPs:

The antibacterial activity of AuNPs synthesized from pathogenic bacteria filtrates *A. baumannii* was tested on Gram-positive *S. aureus* and Gram-negative *E. coli* bacteria using agar disc diffusion, and the antibiotic gentamicin was used as a positive control. The inhibition zone of AuNPs on bacteria *E. coli* was 22 mm Fig (10) whereas the inhibition zone on bacteria *S. aureus* was 24 mm Fig (11). These results demonstrate the considerable activity of AuNPs against both positive and negative bacterial isolates, i.e. a significant result compared to the antibiotic gentamicin (20mm).

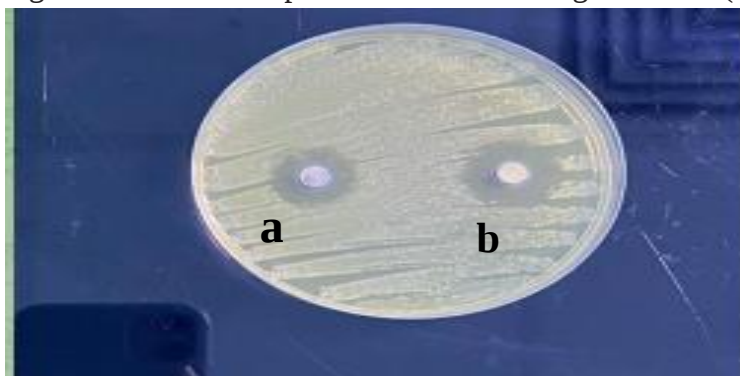


Fig (10) Inhibition zone on *E.coli* a) gentamicin b) AuNPs

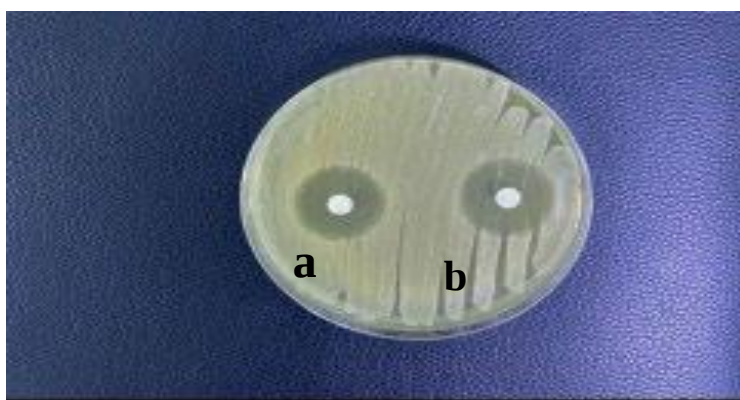


Fig (11) Inhibition zone on *S. aureus* a) gentamicin b) AuNPs

The results indicate that the biosynthesized AuNPs were more effective (more sensitive) on *S. aureus* bacteria compared to *E. coli* bacteria and this antibiotic is due to the fact that the NPs are able to adhere to the bacterial cell wall *S. aureus* and then penetrate its wall, which leading to cell death (Mohanlall&Biyela,2022). The size of NPs has a significant impact on their antibacterial action; smaller particles have demonstrated stronger antibacterial activity because of their increased capacity to penetrate bacteria (Yousaf *et al.*,2020).

#### Conclusion:

Using pathogenic bacteria found and identified by DNA extraction, the current study provides a positive outcome on the usage of AuNPs as efficient alternative antibacterials. These findings showed that, in the right circumstances, certain harmful bacteria can biosynthesize AuNPs. Subsequently, the synthesized AuNPs' biological activity was evaluated on two kinds of harmful bacteria to determine their inhibitory capacity, and they did, in fact, indicate a high likelihood of inhibition.

## References:

- A. A. Hassan and A. F. Mahmoud, "Isolation, Phenotypic and Molecular Identification of Actinomycetes From Soil and Evaluation of Their Efficiency in Control of the Pathogen *Botrytis cinerea* Caused Gray Rot Disease on Eggplant," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 1060, no. 1, pp. 0–16, 2022, doi: [10.1088/1755-1315/1060/1/012108](https://doi.org/10.1088/1755-1315/1060/1/012108).
- Alfryyan, N., Kordy, M. G. M., Gabbar, M. A., Soliman, H. A., and Shaban, M. (2022). Characterization of the biosynthesized intracellular and extracellular plasmonic silver nanoparticles using *Bacillus cereus* and their catalytic reduction of methylene blue. *Scientific Reports*, 12(1), 12495. Doi: <https://doi.org/10.1038/s41598-022-16029-1>
- Al-Naqshbandi, A. A., Chawsheen, M. A., and Abdulqader, H. H. (2019). Prevalence and antimicrobial susceptibility of bacterial pathogens isolated from urine specimens received in rizgary hospital — Erbil. *Journal of Infection and Public Health*, 12(3), 330–333, <https://doi.org/10.1016/j.jiph.2018.11.005>
- Chang, Y., Zheng, C., Chinnathambi, A., Alahmadi, T. A., & Alharbi, S. A. (2021). Cytotoxicity, anti-acute leukemia, and antioxidant properties of green-synthesized gold nanoparticles using *Cannabis sativa* L leaf aqueous extract. *Arabian Journal of Chemistry*, 14 (4), 103060, <https://doi.org/10.1016/j.arabjc.2021.103060>
- Dehbanipour, R., & Ghalavand, Z. (2022). *Acinetobacter baumannii*: Pathogenesis, virulence factors, novel therapeutic options and mechanisms of resistance to antimicrobial agents with emphasis on tigecycline. *Journal of Clinical Pharmacy and Therapeutics*, 47 (11), 1875-1884, <https://doi.org/10.1111/jcpt.13787>
- Hatipoğlu, A. (2021). Rapid green synthesis of gold nanoparticles: Synthesis, characterization, and antimicrobial activities. *Prog. Nutr*, 23, e2021242.
- Horikoshi, S., & Serpone, N. (Eds.). (2013). *Microwaves in nanoparticle synthesis: fundamentals and applications*. John Wiley & Sons.
- Hosseini, M., Mashreghi, M., & Eshghi, H. (2016). Biosynthesis and antibacterial activity of gold nanoparticles coated with reductase enzymes. *Micro & Nano Letters*, 11 (9), 484-489, <https://doi.org/10.1049/mnl.2016.0065>
- I. A. J. Ibrahim, T. A. Kareem, Y. M. Azeez, and H. K. Falhi, "Phylogenetic tree analysis based on the 16S sequence alignment for *Klebsiella* spp. Isolated from different sources," *Iraqi J. Sci.*, vol. 60, no. 12, pp. 2618–2628, 2019, doi: 10.24996/ijs.2019.60.12.10, DOI: [10.24996/ijs.2019.60.12.10](https://doi.org/10.24996/ijs.2019.60.12.10)
- Ijaz, I., Gilani, E., Nazir, A., & Bukhari, A. (2020). Detail review on chemical, physical and green synthesis, classification, characterizations and applications of nanoparticles. *Green chemistry letters and reviews*, 13 (3), 223-245, <https://doi.org/10.1080/17518253.2020.1802517>
- Khan, N., Ali, S., Latif, S., & Mehmood, A. (2022). Biological synthesis of nanoparticles and their applications in sustainable agricultural production. *Natural Science*, 14 (06), 226-234, <https://doi.org/10.4236/ns.2022.146022>

- Mohanlal V & Biyela B,(2022)** Biocatalytic and biological activities of *Kigelia africana* mediated silver monometallic and copper-silver bimetallic nanoparticles. *Indian J Biochem Biophys*, 59 (2022) 94, <http://nopr.niscpr.res.in/handle/123456789/59069>
- Qamar, S. R. U., & Ahmad, J. N. (2021).** Nanoparticles: Mechanism of biosynthesis using plant extracts, bacteria, fungi, and their applications. *Journal of Molecular Liquids* , 334 , 116040, <https://doi.org/10.1016/j.molliq.2021.116040>
- R., Malathi, S., & Palani, P. (2019).** Green synthesis and characterization of bioinspired silver, gold and platinum nanoparticles and evaluation of their synergistic antibacterial activity after combining with different classes of antibiotics. *Materials Science and Engineering: C*, 96, 693-707, <https://doi.org/10.1016/j.msec.2018.11.050>
- Rajan, A., Rajan, A. R., & Philip, D. (2017).** Elettaria cardamomum seed mediates rapid synthesis of gold nanoparticles and its biological activities. *OpenNano* , 2 , 1-8, <https://doi.org/10.1016/j.onano.2016.11.002>
- Srivastava, N., & Mukhopadhyay, M. (2013).** Biosynthesis and structural characterization of selenium nanoparticles mediated by *Zooglea ramigera*. *Powder technology* , 244 , 26-29, <https://doi.org/10.1016/j.powtec.2013.03.050>
- Sadiq, Z., Safiabadi Tali, S. H., Hajimiri., Al-Kassawneh, M., & Jahanshahi-Anbuhi, S. (2024).** Gold nanoparticles-based colorimetric assays for environmental monitoring and food safety evaluation. *Critical Reviews in Analytical Chemistry* , 54 (7), 2209-2244, <https://doi.org/10.1080/10408347.2022.2162331>
- Shah, S. S., Shaikh, M. N., Khan, M. Y., Alfasane, M. A., Rahman, M.M., & Aziz, M. A. (2021).** Present status and future prospects of jute in nanotechnology: A review. *The Chemical Record*, 21(7), 1631-1665. <https://doi.org/10.1002/tcr.202100135>
- Sirisha, T., Aleem Bash, P., and Kavitha, B. (2017).** Isolation and characterization of pathogenic bacteria from Kundu river water of Nandyal, Kurnool, Andhra Pradesh, India. *Journal of Applied Sciences*, 17(9), 475–481, <https://doi.org/10.3923/jas.2017.475.481>
- Srinath, B. S., & Rai, R. V. (2015).** Biosynthesis of gold nanoparticles using extracellular molecules produced by *Enterobacter aerogenes* and their catalytic study. *Journal of Cluster Science* , 26 , 1483-1494. <https://doi.org/10.1007/s10876-014-0835-9>
- Sunderam, V., Thiagarajan, D., Lawrence, A. V., Mohammed, S. S., & Selvaraj, A. (2019).** In-vitro antimicrobial and anticancer properties of green synthesized gold nanoparticles using *Anacardium occidentale* leaves extract. *Saudi Journal of Biological Sciences* , 26 (3), 455-459. <https://doi.org/10.1016/j.sjbs.2018.12.001>
- Yadav, R. K., Jangeer, S., Parashar, R., Sharma, G., Meena, P., Meena, M. K., & Patel, D. D. (2023)** A Critical Review on Nanoparticles Synthesis: Physical, Chemical and Biological Perspectives. *IJCRT11* .
- Yousaf, H., Mehmood, A., Ahmad, K. S., & Raffi, M. (2020).** Green synthesis of silver nanoparticles and their applications as an alternative antibacterial and antioxidant agents. *Materials Science and Engineering: C*, 112, 110901. <https://doi.org/10.1016/j.msec.2020.110901>

## Conflicts of Interest Statement.....

### Manuscript title:

**Green synthesis of gold nanoparticles (AuNPs) using pathogenic bacteria *Acinetobacter baumannii* with evaluation their antibacterial activity**

The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

### Author names:

1. Hawraa Khalaf Abbood

2. Rashid Rahim Hateet

Department of Biology

College of Science

University of Misan

The authors whose names are listed immediately below report the following details of affiliation or involvement in an organization or entity with a financial or non-financial interest in the subject matter or materials discussed in this manuscript. Please specify the nature of the conflict on a separate sheet of paper if the space below is inadequate.

### Author names:

Hawraa Khalaf Abbood

Department of Biology

College of Science

University of Misan

Asistant.Prof.Dr.Rashid Rahim Hateet

Department of Biology

College of Science

University of Misan

This statement is signed by all the authors to indicate agreement that the above information is true and correct (a photocopy of this form may be used if there are more than 10 authors):

Author's name (typed)

Author's signature

Date

Hawraa Khalaf Abbood



2025-1-19

Rashid Rahim Hateet



2025-1-19