VOLUME - 13, ISSUE - 10, OCTOBER - 2024 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper | Biotechnology

THE SKIN EXTRACT OF VITIS VINIFERA GOLD NANO PARTICLES CAN BE USED AS A LEAD MOLECULE FOR THE TREATMENT OF LUNG CANCER

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ABSTRACT In this study, Vitis vinifera skin extract combined with Auric Chloride was used to produce Gold Nanoparticles. gold nanoparticles (AuNPs) were synthesized using the Turkevich method and it explains step-by-step synthesis of the entire process, including a well-explained mechanism and characterization study. Composition, size, structure, crystal phase, is also determined from spectroscopy techniques like DLS, EDS and UV- vis. The materials (Vitis skin and AuNPs) were characterized using dynamic light scattering (DLS), Energy dispersive spectroscopy (EDS), UV-Vi's spectroscopy. The DLS presented an average particle size of 3.3 ± 0.9 nm and a polydispersity index (PDI) of 0.574. EDS of AuNPs identified total number of particles and its existence in nano particles with variation of elements and its atomic percentage is oxygen and potassium (o-k) 36.27, gold metal (Au M) 23.62, chloride and potassium (cl k) 23.46 and potassium (k k) 16.66. EDS analysis was performed to confirm the chemical composition of synthesized AuNPs. The UV-Vis spectrum exhibits an absorption maximum at 300-800 nm because of the surface plasmon resonance (SPR) absorption band of the AuNPs. The above results may conclude that formation of nanoparticles, size of each particle and its structure of the particle can be used in several applications.

KEYWORDS : Gold Nanoparticles, Synthesis, Vitis vinifera skin Extract, Turkevich Method, Characterization, AuNp's

INTRODUCTION:

Vitis Vinifera, a popular fruit cultivated globally, generates a large amount of V.vinifera pomace waste after juice and wine making. More importantly, the V.vinifera skin extract contains a significant amount of bioactive compounds such as resveratrol, phenolic acid, flavonoid and proanthocyanidin, all of which can be used as both reducing and stabilizing agents for synthesis of AuNPs[1]. Gold nanoparticles (AuNPs) have unique physical, chemical, and biological properties compared to other metal NPs like silver and zinc NPs **[2,3].** The properties of NPs depend upon their unique shape and size **[4-5].** Due to the different shapes and sizes of AuNPs, they are used in different areas like electronics, catalysis, decorative coatings and paints, pollution control, cancer therapy, drug delivery, biomedical assay, biosensor, bio-imaging, etc **[6-12].** Gold nanoparticles (AuNPs) have attractive physical properties, including surface plasmon resonance (SPR) **[13-15].** AuNPs of various sizes and shapes have been fabricated using different techniques and routes. These synthetic approaches have been performed using physical, chemical, and biological methods. Since they have proposed synthesis using a modified version of the Turkevich method **[16-19].** In addition, AuNPs exhibit excellent biocompatibility owing to their high binding affinities to biomolecules. Both covalent and noncovalent approaches have been designed to conjugate AuNPs. The most common covalent conjugation is the direct attachment of the thiolate molecule to AuNPs. Non-covalent interactions are usually due to electrostatic interactions, hydrophobic interactions, and specific binding affinities **[20,21]** the most common approach for synthesizing AuNPs is chemical methods. It usually employs three components: a metal precursor, reducing agent, and stabilizing/capping agents. The metal precursor is a metallic salt, such as gold.

MATERIALS AND METHODS:

Reagents:

Gold (III) chloride ($AuCl_3$) was purchased from Sygmos Fine Chem and Vitis vinifera was purchased from local market Andhra Pradesh, Vijayawada. All reagents were of analytical purity and all solutions were prepared with purified water using a deionized water.

Preparation Of Aqueous Vitis Vinifera Extract:

The fresh vitises are collected and washed with tap water and later with deionized water to remove dust and debris . In a conical flask about 250gms of vitis skin were taken with 200 ml of distilled water heated for 1hr, after cooling filtrate was filtered carefully with Whatman filter paper No.1. Then the extract was collected and preserved in -20^{0}c for further studies.

Synthesis of Gold nano particles:

Stock solutions of V. vinifera skin were prepared. Subsequently, V. Vinifera skin extract was added to 50 mL of deionized water, and the solution was agitated and heated to 90C. When the required temperature was achieved, 2mm of auric chloride was quickly added. Agitation and heating at 90 C were performed for 20 min. The colour of the suspension changed from purple/red, indicating the formation of AuNPs. The AuNPs suspension was then slowly cooled to room temperature and maintained at 4 C. Synthesis of Gold Nanoparticle AuNPs were synthesized using the Turkevich method, and photographs of the process are shown in Figure 1. As observed in the photographs, during synthesis, the suspension colour changed from pink to red/purple colour. At this point, the suspension started to turn purple/red colour, which is a characteristic of AuNPs. At the end of the synthesis (20 min), Notably, the suspension must be continuously stirred during the synthesis or precipitation of Au

Characterization Techniques:

a. Dynamic Light Scattering (DLS):

Dynamic light scattering (DLS) was used to evaluate the average size distribution, and possible aggregation of the synthesized AuNPs **[22,23].** The zeta potentials were also measured. **Figure 1 (a, d, c, d, e, f, g)** shows a graph of the particle size distribution (differential number % and cumulative number %). The values obtained from the zeta potential graphs are also presented.

AuNPs are small gold particles with diameters of 1–100 nm. Particles smaller than 10 nm can be consider ultrasmall AuNPs; the particle size obtained was 3.3 ± 0.9 nm. Hence, according to DLS, synthesized AuNPs are ultra-small nanoparticles **[24-26].**

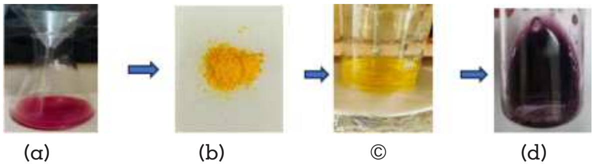
B. Energy Dispersive Spectroscopy (eds)

Energy dispersive spectroscopy (EDS) analysis was performed to confirm the chemical composition of synthesized AuNPs. The EDS spectrum analysis of gold nanoparticles indicated that the gold atoms emitted strong signals, shown in **figure 2,3**and **Table 1**, while other elements such as chloride, oxygen, and potassium. The impurities from the e-waste remained in the gold nanoparticles identified by the EDS **[27,28].** The presence of Au peaks in the EDS analysis suggested that the gold ions were extracted to elemental gold nanoparticles from the e-waste. The weight percentages of the various types of elements identified in the extracted gold nanoparticles were quantified using the EDS analysis are presented.

C. UV-visible spectroscopy:

V. Vinifera based AuNPs samples were characterized using different techniques. UV-Vis Spectrometry was performed using a spectrophotometer range between 400–800 nm. The sample were diluted in deionized water using a quartz cuvette **figure 4,5** and **Table 2.**

RESULT AND DISCUSSION:



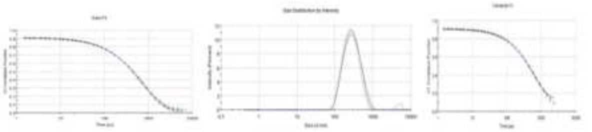
(a) (b) © (d)

Figure1: Synthesis of gold nano particles
(a). Stock preparation of V. Vinifera
(b). 49% of Auric chloride powder
(c). Synthesis of Gold Nanoparticle AuNPs
(d). Vitis Vinifera based Gold Nanoparticles

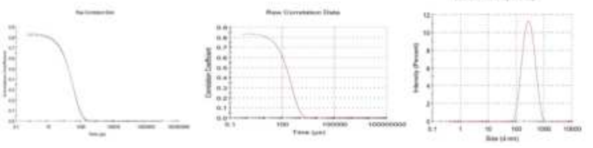
Synthesis of Gold Nanoparticle AuNPs were synthesized using the Turkevich method, and photographs of the process are shown. As observed in the photographs, during synthesis, the suspension colour changed from pink to red/purple colour. At this point, the suspension started to turn purple/red colour, which is a characteristic of AuNPs. In addition, the temperature was precisely controlled because it is a defining parameter in the synthesis of AuNPs. Increasing the temperature usually decreases the size of AuNps. Hence the chosen temperature was 90^{0}C, which Was kept constant during all synthesis **[29]** A colour change was clearly observed when comparing the stock solutions of V. Vinifera and the synthesized AuNPs. This results in a AuNPs purple/red suspension, which is characteristic of stable AuNPs suspensions of gold nanoparticles.

Dynamic Light Scattering (DLS):

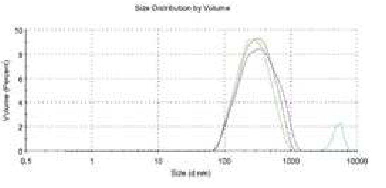
Dynamic light scattering (DLS) was used to evaluate the average size distribution, and possible aggregation of the synthesized AuNPs. As observed from the particle size distribution graph, an average particle size of 3.3 0.9nm and polydispersity index PDI of 0.266 were obtained. regarding the zetapotential, the value found was 219.3 d.nm. as disused previously AuNPs are small gold particles with diameter of 1-100mm particles smaller then 10nm can be consider ultra small AuNPs.



(a) Distribution **(b) Intensity** **(c)cumulants**



(d) Correlogram **(e) Correlation** **(f) Size distribution**



(g) Volume
Figure:2

In Dynamic light scattering (DLS) peaks, volume percentage and St Dev (d. nm) observed. The peak 1 size observed in 340.9 (d. nm), volume % 100.0 and St Dev (d. nm) is 189.0 shown in Image b. and peak 2 size were observed in 303.6 (d. nm) volume % 100.0 and St Dev (d. nm) is 147.3 shown in Image g.

Energy Dispersive Spectroscopy (EDS):

Energy-dispersive spectroscopy X analysis (EDS) is a technique used for the measurement of nanoparticles by SEM. In this technique, the nanoparticles are analyzed by activation using an EDS X-ray spectrophotometer, which is generally present in modern SEM. The individual separated nanoparticles are deposited on a suitable substrate that does not interfere in the characterization of nanoparticles. The EDS are generated according to the characteristics and nature of the elements present in the sample. Hence, this technique also can be used to measure the energy of emitted X-rays. This method gives accurate results for not only element detection, but also to determine their concentration after maintaining the ideal instrumental conditions. EDS of AuNPs identified total number of particles and its existence in nano particles with variation of elements and its atomic percentage in (o-k) is 36.27, and weight percentage is 36.27, (Au M) atomic percentage 23.62 and weight percentage 23.62, In (cl k) atomic percentage 23.46 and weight percentage 23.46 and (k k) atomic percentage is 16.66 and weight percentage is 16.66. EDS analysis was performed to confirm the chemical composition of synthesized AuNPs.

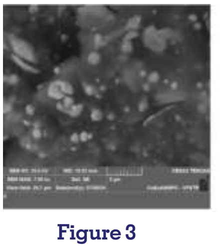


Figure 3

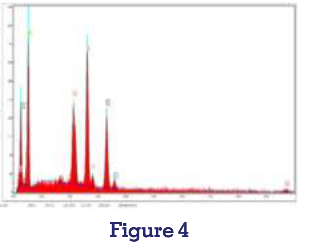


Figure 4

Table :1

Element	Weight%	Atomic%	Net. Int	Error%
O k	36.27	65.25	151.84	10.97
Au M	23.62	3.45	105.03	7.25
CIK	23.46	19.04	186.37	5.73
K K	16.66	12.26	99.25	8.80

UV-Vi's spectroscopy:

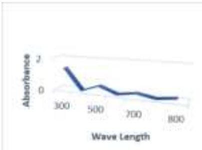


Figure:5

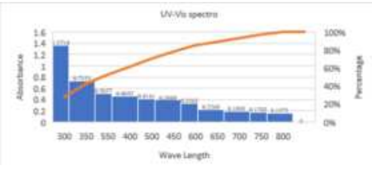


Figure: 6

Table 2: UV- Vi's wavelength and absorbance

Wave Length (NM)	300	350	400	450	500	550	600	650	700	750	800
Absorbance Un0001(c 11)	1.3714	0.7333	0.5057	0.4692	0.4161	0.3909	0.3362	0.2268	0.1895	0.1742	0.1573

The UV-Vis absorption spectrum of gold nanoparticles in the presence of V.vinifera skin extract. The intensity of colour increased with the time of incubation; The purple/ light ruby red colour appears due to the surface plasmon of the biosynthesized AuNPs, which is the indication for the synthesis of AuNPs. UV-VIS spectra are one of the most sensitive, easy, and primary methods to check the synthesis of AuNPs. The absorbance of the sample was recorded between 300-800 nm by using a Hitachi-2000 UV-visible spectrophotometer

DISCUSSION:

Synthesis of gold nanoparticles shows mechanism and specific drug activity attempted to explain step-by-step, AuNPs were synthesized using the Turkevich method. In this method involves the using stock solution of V.vinifera skin extract at high temperatures. A purple/red suspension was obtained, indicating the formation of AuNPs. AuNPs were synthesized using a simple and rapid method. The resulting spherical and small particles can be used for several applications.

The synthesis of AuNPs is also confirmed by Dynamic light scattering (DLS) was used to evaluate the average size distribution, and possible aggregation of the synthesized AuNPs. As observed from the particle size distribution graph, an average particle size of 3.3 0.9nm and polydispersity index PDI of 0.266 were obtained. regarding the zetapotential, the value found was 219.3 d.nm. The morphology of the V. vinifera synthesized AuNPs was demonstrated by the Energy-dispersive spectroscopy (EDS) are generated according to the characteristics and nature of the elements present in the sample. Hence, this technique also can be used to measure the energy of emitted X-rays. UV-VIS spectra are one of the most sensitive, easy, and primary methods to check the synthesis of AuNPs. The absorbance of the sample was recorded between 300-800nm by using a Hitachi-2000 UV-visible spectrophotometer.

CONCLUSION:

Vitis vinifera skin extract combined with Auric Chloride was used to produce Gold Nanoparticles. These gold nanoparticles show good biocompatibility and degradability. Identified V. vinifera skin extract gold nano particles can be used as a lead molecule for the treatment of lung cancer cell and that drug was free from side effects.

The project mainly aims to synthesize nanoparticles from Vitis skin extraction by using Gold chloride which represents the beginning of an eco-friendly, cost-effective, easy and simple approach without environmental barriers.

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