American Research Journal of Biotechnology

Volume 1, Issue 1, 24-31 Pages
Research Article | Open Access

AMERICAN RESEARCH JOURNALS
An Academic Publishing House

Fabrication of Silver Nanoparticles by Phoma Glomerata and its Combined Effect Against Escherichia Coli, Pseudomonas Aeruginosa and Staphylococcus Aureus

Olawole O Obembe

Department of Biological Sciences, Covenant University, Canaan Land, Ota, Nigeria.

ABSTRACT

Antibiotics that had silver nanoparticles added to them shown a level of sensitivity to bacteria that had become resistant to other forms of antibiotics that had not been achievable in the past. In the past, it was impossible to achieve this degree of sensitivity. In addition to the outcomes, the following processes were involved: One millimole of silver nitrate was needed per liter in order to begin the process of biosynthesis for Ag-NPs and the process of challenging the fungal cell filtrate. Both of these processes had to be carried out in sequence. The technique of calculating the diameters of the Ag-NPs that was used was scanning electron microscopy (SEM). The biosynthetic approach looks, at the end of the day, to cause minimal danger to the local environment and to be uncomplicated to adopt on a more broad scale. In addition, the technique seems to be able to provide desirable results. Because these Ag-NPs originate from biological sources, there is a potential that they will show to be an ideal pharmaceutical choice and give a solution to the issue of chemical agents. If this turns out to be the case, it will provide a solution to the problem of chemical agents. If anything like this takes place, the issue with chemical agents will be addressed. In the event that anything like takes happen, the problem with the chemical agents will be handled. The Importance of Conducting the Study Itself, in Addition to the Importance of the Results That It Obtained: One of the features of this worrying trend that is one of the most troubling is the startlingly rapid pace at which microorganisms are gaining resistance to antibiotics. In order to properly address this issue in a manner that is appropriate, the production of bactericides is a necessity that needs to be addressed as soon as it is humanly possible to do so. The treatment of antibiotic-resistant bacteria using silver nanoparticles (Ag-NPs), which has the potential to be an effective form of therapy, may result in favorable responses from the bacteria.

INTRODUCTION

The process of creating functional systems on an atomic size via the creation of nanoscale structures is what is referred to as nanotechnology, which is also commonly abbreviated as "NT." The method is referred to by its more general moniker, nanotechnology. As a direct result of this, the NT is able to function on a variety of levels, including the atomic, molecule, and supramolecular levels. In order to do research on and perform out modifications of biological systems, NT takes use of the resources and technical platforms that biology makes available. These are made available via the field of biology. Because of this, NT is able to perform study on biological systems and carry out modifications of such systems. In return, biology offers NT models that are derived from biological processes, as well as components that are constructed utilizing biological processes (Mihail 2003). In the field of medicine, there are an extensive variety of applications that demand for the use of topical bactericides like silver, for instance (Yamanaka et al. 2005). As a direct result of the evolution of NT, nanoparticles, in contrast to microparticles, contain an abnormally large number of surface atoms. This difference may be attributed to their size. In contrast to microparticles, this is an example of. This leads to a considerable augmentation of the physicochemical features of the nanoparticles as well as the characteristics of the nanoparticles themselves in terms of their physical qualities. These nanoparticles have a broad range of potential uses in many different fields. The use of chemicals that have the potential to be hazardous to human health at any point throughout the course of the synthesis procedure has the potential to bring about a deterioration in that health (Chen et al. 2003).This is one of the most important things to keep in mind. Because of this, biological systems like bacteria and fungi have been put to great use in the production of metal nanoparticles in a way that is not only effective but also safe for the environment in which it is performed. This is as a result of the fact that biological systems such as these are able to generate nanoparticles without having a detrimental effect on the environment that they are surrounded by (Bhattacharya and Gupta 2005). This is because inorganic materials can be synthesized by any kind of creature. Because

of their adaptability, nanoparticles may be used in a broad range of different contexts. This is because the creation of inorganic materials may take place both within and outside of the cell, which explains why this is the case.

In recent years, research has been conducted out that investigates the potential for microorganisms to be utilized in the production of a wide variety of metal nanoparticles. This line of inquiry was prompted by recent developments in the field. The idea that microbes have the ability to create metal nanoparticles serves as the foundation for this area of investigation. Other works include research on microorganisThe following references provide access to this study's findings: (Robinson et al. 1997). In recent years, fungus has been used as a tool to assist in the synthesis of a broad variety of distinct kinds of metal nanoparticles. These nanoparticles may be thought of as being on the size of particles that are really small. Other examples include gold nanoparticles produced by Fusariumacuminatum and Colle Gold nanoparticles produced by Fusariumacuminatum and Colle are two further examples. Additionally, there are the nanoparticles that are produced by the lichen fungus, which may be found here: (Usnealongis). One of the many applications of these fungi is in the production of silver nanoparticles, which is accomplished by using the fungi F. acuminatum and Aspergillus f. as the primary organisms in the production process. This application is just one of the many ways that these fungi have been put to use (Bansal et al. 2004). Quantum dots formed of CdS are produced when the cell of Candida glabrata is exposed to ions of the element $Cd2+$. This process takes place during the formation of quantum dots. This process takes place on the level of the individual cells (Dameron et al. 1989). Fungi also have many other advantages, such as the ability to produce more complex metabolites from simpler building blocks. Fungi also have the ability to metabolize Ag-NPs in a more straightforward manner than is possible for other species. The ability to cope with silver nanoparticles (Ag-NPs) more readily is one of the many advantages that fungi have over bacteria. Fungi have a number of other advantages as well. Fungi provide a lot of advantages that bacteria do not, despite the fact that bacteria are simpler to culture than fungus. Mycelia are the filamentous structures that are produced by fungi. Mycelia have the potential to grow to sizes that are notable, and they also have the capability of covering a significant amount of surface area with relative ease. Both of these qualities contribute to the economically feasible quality of the system, making it more attractive to potential investors. According to research that was conducted in the past, Ag-NPs have been shown to be effective in a wide number of antibacterial applications. These applications include: (Sondi and Salopek-Sondi 2004; Kim et al. 2007; Shrivastava et al. 2007). Utilizing cloths infused with Ag-NP has the potential to aid in the reduction of the spread of dangerous pathogens like Staphylococcus aureus in healthcare institutions. This might be accomplished by preventing the spread of potentially infectious bacteria (Duran et al. 2007). Both A. niger and F. acuminatum have been demonstrated to be capable of the extracellular mycosynthesis of silver nanoparticles, according to studies carried out by Additionally, this therapy was successful in eliminating a wide variety of bacteria that were resistant to many antibiotics. Additionally, this treatment proved effective in eradicating a broad range of antibiotic-resistant bacterial strains across the board. In addition to that, it was discovered that this therapy was successful in eliminating a wide variety of antibiotic-resistant bacteria in their entirety. In order to get started on the creation of silver nanoparticles, a common plant disease called Phomaglomerata was utilized. These nanoparticles were developed as a result of this effort. There is just one species of Phoma, and its name is Phomaglomerata. It has a wide distribution, and it is possible to find it all over the world.

SPECIES AND MATERIALS RELATED TO PHOMA

Thanks to the assistance of Phomaglomerata, the manufacturing of silver nanoparticles (also known as Ag-NPs) was successfully completed (MTCC-2210). The Microbial Type Culture Collection Center (MTCC), which is housed under IMTECH in the Indian city of Chandigarh, was identified as the establishment from whence the culture originated. In order to get the culture ready for use at a later time, it was maintained on potato dextrose agar (which consisted of one liter of distilled water, 250 grams of potato infusion, 20 grams of dextrose, 20 grams of agar, and one gram each of agar and dextrose), and it was kept at a temperature of four degrees Celsius. Both of these steps were carried out in order to get the culture ready for use at a later time. Both of these procedures were carried out so that the culture would be prepared for usage at a later point in time.

The Use of Phomaglomerata as a Fundamental Component Makes it Practicable to Produce Silver Nanoparticles. [Citation Needed]

Mycelia of the fungus were cultured in two Erlenmeyer flasks, with one hundred milliliters of potato dextrose broth included in each flask. The flasks were placed in an incubator at room temperature. This action was taken so that the fungus might be grown in culture. They were kept in that location for a total of 48 hours at a temperature of 25.2 degrees Celsius, and during that period they were rotated at a rate of 120 times per minute (Borosil, India). Before being washed, the mycelia were filtered using Whatman filter paper number 42 after being cleaned with water that had been disinfected with distilled alcohol. This was done before the mycelia were washed. After that, one hundred milliliters of sterile distilled water with mycelium suspended in it was put in an incubator and allowed to stay there for twenty-four hours at a temperature of 252 degrees Celsius. The incubator

was set at the same temperature during this whole process. The temperature contained inside the incubator was kept at a constant level at all times. After removing the cell debris from the sample by the process of filtering, the sample was then subjected to an incubation process at room temperature with a solution of silver nitrate. This operation went place over the course of a good number of hours. On the cell filtrate that had been treated, an absorption filtrate of fungal cells is indicated by the presence of a coloring in the filtrate that has the appearance of being dark brown. [The series of events that led to this]

During the Process of Determining whether or Not Ag-NPs are Present, the following Methodology is Utilized

Spectroscopy throughout the all of the electromagnetic spectrum, from light that is not visible to light that is very ultraviolet and everything in between The color of the cell filtrate that was being collected shifted noticeably when silver nitrate was added to the combination. This was easily observable. Observers saw the shift almost immediately. This goal was reached by the use of the instrument. This was done in order to get a more comprehensive understanding of the characteristics that the Ag-NPs had.

This Study will Investigate the Properties of Silver Nanoparticles (Ag-NPs)

Spectroscopy of infrared light that is performed with Fourier transforms as the primary method of analysis. Following the transformation of the fungal filtrate into Ag+ ions, the mixture was centrifuged for fifteen minutes at a speed of 10,000 g while the procedure was being carried out. Throughout this period, the supernatant was continually reconstituted with distilled water in order to maintain its consistency. There were a total of three occasions that this treatment was carried out. When sodium chloride is added to silver ions that have not yet experienced any chemical reactions, a white precipitate is created. This happens anytime the silver ions have been isolated. This is due to the fact that silver ions have not yet experienced any kind of chemical transformation. This takes place anytime the silver ions are located in their own distinct space. Adding sodium chloride to the nanoparticle solution, which did not result in the formation of any precipitate, indicating that there was no leftover unreacted silver in the solution. However, the addition of sodium chloride did not result in the development of any precipitate. This was shown by the fact that the nanoparticle solution did not include any silver that had not as of yet undergone any reactions. During the course of the examination of the substance, a method known as which was also the resolution of the FTIR spectrum, was 4 cm1, and this resolution was also used for the FTIR spectrum. During the course of the investigation, a range that included everything from 4,000 cm-1 all the way up to 4,000 cm-1 was investigated.

The Term "Scanning Electron Microscopy" Refers to a Specific Kind of Microscopy (Abbreviated as SEM for Short)

The JEOL 6380A scanning electron microscope was used so that these images could be obtained. After allowing the samples to incubate for the designated amount of time at room temperature, they were thereafter treated with glutaraldehyde to achieve a permanent stain (24 hours total). After the sample had been fixed, it was first placed through a dehydration process in an alcohol gradient that ranged from 10 to 95 percent, and then it was allowed to incubate for a period of 20 minutes in each gradient. This procedure was repeated three times. This was done so that the manufacturing of Ag-NPs would be facilitated more easily. After that, the sample was inserted into the Phomaglomerata and left to stay there for an unspecified amount of time. The authors made use of absolute alcohol for a duration of time that ranged from two minutes up to five minutes. A drop of the dehydrated substance was first put on a glass slide, and then a monolayer of platinum was coated on top of it. After that, the slide was looked at under a microscope to see what was on it. It was required for the specimen to be treated in this manner in order for the surface of the specimen to be able to conduct electricity.

The Properties of these Nanoparticles Make it Difficult for Microorganisms to Live an an Environment That also Contains Ag-NPs. This is because Ag-NPs Impede the Growth of Germs

Several antibiotics were put through a bactericidal activity test, which consisted of plating the test bacteria on plates of Muller–Hinton agar and putting them through the bactericidal activity test. This was done in order to determine whether or not the antibiotics had the ability to eradicate the test bacteria, which included E. coli JM-103 (ATCC-aeruginos While carrying out this operation, the method of disc diffusion was used (MTCC 424). (Bauer et al. 1966). Throughout the whole development process, which took place on slants of nutritional agar, the bacterial cultures were kept at a temperature of four degrees Celsius in order to provide optimal conditions. The firm that was in charge of the distribution of the standard antibiotic CDs was one that was known by the name before evaluating the effects of both components at the same time, a coating of 15 ll of solution containing Ag-NPs was applied to each standard paper disc. This was done before the simultaneous testing. This was done so that the impacts of both components could be evaluated side-by-side and contrasted with one another. This was done so that a comparison could be made between the effects of the two separate components, and this was the motivation for why this was done. In previous tests of a comparable kind, the sole type of subject matter that was put through its paces was ag-nanoparticles. During the course of

the evening before, one colony of each strain was cultured on a rotary shaker at a speed of one hundred revolutions per minute 2 in a liquid medium consisting of Muller and Hinton at a temperature of 37 degrees Celsius. After what seemed like an age, the inocula and the discs that had been manufactured and contained Ag-NPs were eventually put on the plates. Also placed on the plates were the discs that held the inocula. In addition to that, a careful cleaning was carried out on each of the plates. An examination of the inhibitory zone was carried out after a total of 24 hours had been spent incubating the substance at 37 degrees Celsius. There were a total of three separate iterations of each test that were conducted.

The Following Procedures will need to be Carried Out in Order for us to Arrive at an Accurate Estimation of the Amount by which the Fold Area has Increased

In order to reach this conclusion, we began by conducting an analysis that measured the typical amount of surface area that was covered by the inhibitory zone produced by each antibiotic that was taken into consideration. This allowed us to determine the amount of surface area that was covered by the inhibitory zone. Because of this, we were able to determine the most effective line of action. Using this approach, the size of Staph. aureus' inhibition zone (A) as well as the area of Staph. aureus+Ag-inhibition NPs' zone were calculated (B). By using the formula (b2) a2) a2, it was possible to calculate the size of the Staph. This equation was expressed as (d2)c 2)c 2, where C and D indicate the zones of inhibition for antibiotics alone and antibiotics coupled with Ag-NPs, respectively. This equation was stated in a mathematical notation.

RESULTS

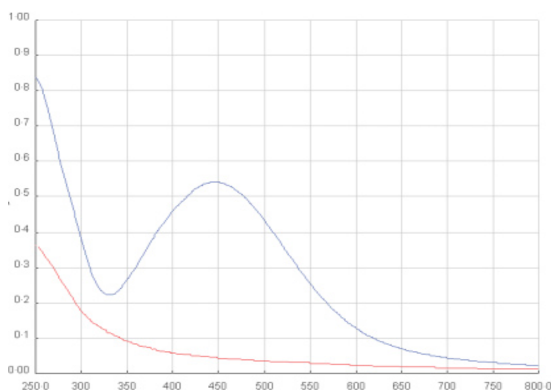
The brilliant yellow hue of the cell filtrate changed to a dark brown tint after being treated with 1 mmol l-1 of AgNO3 in the reaction vessels. This treatment caused the cell filtrate to change color. This metamorphosis ended up happening. This distinct shift in color is an unmistakable indication that Ag-NPs are being manufactured. A UV–Vis spectroscopy was performed on the Ag-NPs so that the properties of the particles could be analyzed. Utilizing extinguishment spectroscopy, which makes use of the UV–Vis spectrum, gives proof for the presence of noble Ag-NPs. [Citation needed] [Citation needed] Examining the absorbance peak that occurs at 440 nm will show you this piece of evidence (Fig. 2). We carried out an analysis of the data that was obtained from a Perkin-Elmer FTIR spectrometer in order to find the biomolecules that were most likely to be responsible for the observed event. This was done so that we could discover the biomolecules that were most likely to be responsible for the observed event.

Silver nitrate (1 mmol l)1 in conical flasks before (left) and after (right) exposure to Phoma glom erata culture supernatant

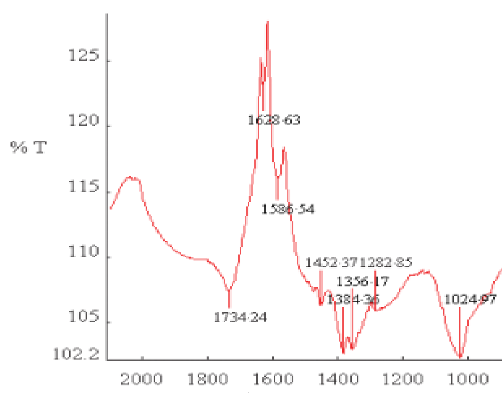
It is vital to lower the number of silver ions present in order to avoid the aggregation of particles and to make the medium more stable. This will enable you to cover the bioreduced silver nanoparticles that were created by the fungal filtrate, which will also make the medium more stable (Basavaraja et al. 2008). (Basavaraja et al. 2008). For instance, the FTIR spectrum indicated the presence of functional groups in the region of 1000–2000 cm-1, which is confirmation that protein molecules are present and are actively working to protect the integrity of the structure (Fig. 3). (Fig. 3). The findings of the scans done using a SEM microscope are given in Figure 4, which displays the data acquired from those scans. The results of these scans led to the conclusion that the reaction mixture had been efficiently synthesized to generate circular Ag-NPs. This conclusion was made based on the results. It was found out that the produced materials had an average size of Ag-NP that ranged between 60 and 80 nm. Studying the aggregate impact that Ag-NPs had on three harmful bacteria—Staph. aureus, E. coli, and Pseudomonas aeruginosa—was performed by the use of the disc diffusion technique. In contrast to antibiotics, which are freely available on the market, this technique was adopted instead. The findings of an experiment are presented in the table below. In this experiment, a variety of antibiotics, some of which incorporated Ag-NPs and others of which did not, were assessed against a selection of test bacteria. Because of this, the synergistic impact was significantly more visible in Staphylococcus aureus than it was in E. coli and Ps. aeruginosa.

DISCUSSION

Figure 1. Phomaglomerata, a potentially harmful bacterium, has been related to the development of antibiotic resistance. Before (left) and after (right) being exposed to the culture supernatant of the bacteria, the conical flasks on the left contain silver nitrate at a concentration of one millimoles per liter. Phomaglomerata was apparently the organism that was utilised in the experiment to manufacture Ag-NPs, as claimed by S.S. Birla and colleagues.



The use of a UV–Vis spectrophotometer for the detection of silver nanoparticles in the cell filtrate of Phomaglomerata (where red represents fungal extract and blue represents fungal extract with 1 mmol l of silver nitrate) Figure 2.



In the picture on the right, you can see the FTIR spectrum that was produced by the extract of Phomaglomerata after the addition of one mole of silver nitrate to the mixture. You will be able to see the spectrum in question by only clicking on the photo.

A significant amount of investigation will be carried out with the main purpose of locating novel antibacterial agents. As an antibacterial treatment, silver nanoparticles, more generally referred to as Ag-NPs, are used; nevertheless, there is a rising worry within the medical community regarding the safety of these nanoparticles (Duran et al. 2007). The utilization of nanoparticles as opposed to bulk materials carries with it the possibility of both favorable and unfavorable outcomes being brought about as a consequence of the change.

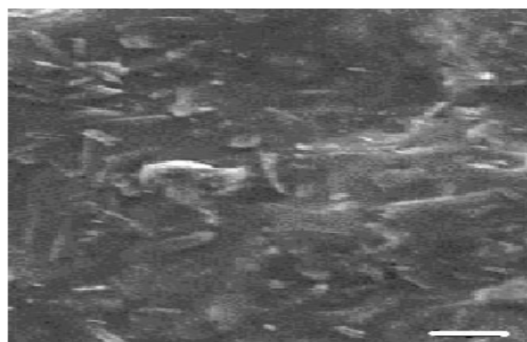


Figure 4. depicts nanoparticles derived from the Phoma glomerata extract (Scale bar 0.05 lm).

Table 1 Zone of inhibition (mm) of different antibiotics against *Staph. aureus*, *E. coli* and *Ps. aeruginosa* [in absence and in presence of silver nanoparticles (Ag-NPs) at content of 15 µl per disc]

	Staphylococcus aureus			*Escherichia coli*			*Pseudomonas aeruginosa*		
Antibiotics	Antibiotic (A)	Antibiotic + Ag-NPs* (B)	Increase in fold area†	Antibiotic (C)	Antibiotic + Ag-NPs* (D)	Increase in fold area†	Antibiotic (E)	Antibiotic + Ag-NPs* (F)	Increase in fold area†
Ampicillin	18	20	0·234	–‡	10	1·777	–	11	2·361
Gentamycin	18	21	0·361	18	23	0·632	22	25	0·291
Kanamycin	22	25	0·291	20	25	0·562	16	17	0·128
Streptomycin	19	24	0·595	13	15	0·331	-	10	1·777
Vancomycin	17	22	0·674	–	11	2·361	–	11	2·361

The relatively small standard deviations may be attributed to the fact that each experiment was carried out three times. One possible explanation for this is that each of the studies was performed three times to ensure accurate results. After computing the surface area of the inhibitory zone, the results were averaged out to produce the overall surface area of the inhibitory zone. The calculation of the inhibitory zone's surface area employed the average diameter of each antibiotic that was put through the test (mm2). A2 = (b2 - a2) When determining how many times more effective certain drugs are against staphylococcus aureus, the a2 formula is what is employed in the procedure. Both (d2 - (f2 - (e2) - e2) and e2 were used in precisely the same manner in order to generate antibiotics that were effective against Ps. aeruginosa and E. coli, respectively. When the bacterial growth inhibition zones were not present, it was assumed that the diameter of the disc was six millimeters, and this value was used in the calculation of the fold increase in the columns 3, 6, and 9. The formation of a symbiotic relationship with the bacteria Phomaglomeratus led to the discovery of a pathway that may be used in the production of silver (Ingle et al. 2008). Because of these results, a considerable advance has been made in the direction that needs to be pursued as a direct consequence of this research. This is the case because of the direct correlation between the two. This is a really heartening piece of new information.

We made the finding that the results generated by Gade et al., who treated A. niger cell filtrate with silver nitrate at a concentration of 1 millimoles per liter, created outcomes that were equivalent to our very own. This was discovered after we found that the outcomes produced by Gade et al. The cell filtrate was subjected to treatment with silver nitrate at a concentration of 1 millimoles per liter, which led to the discovery of these findings (2008). When an extract of Capsicum annum L. was tested with aqueous silver ions, the reaction mixture containing Ag-NPs showed an absorption peak at approximately 440 nm as a result of the excitation of longitudinal silver. These findings lend credence to the inferences made by Li et al., 2007, who pointed out that when an extract of Capsicum annum L. was put to the test with aqueous silver ions, the reaction mixture showed an absorption This research provides more evidence to back

up the findings that Li et al., 2007 came at. The conclusions that may be drawn from these findings are identical to the ones that Li et al., 2007 came at. The results of a UV–Vis spectrophotometer showed that there was a distinct peak at around 440 nm; this peak was unique to the synthesis of Ag-NPs; these results give evidence in favor of the notion (Fig. 2) In an FTIR study of a protein, the infrared region of the electromagnetic spectrum is investigated in order to locate the unique fingerprints of the protein. The amide linkages that are present between the various amino acid residues are the ones responsible for producing these fingerprints. These amide linkages are the ones to thank for the provision of these fingerprints. The spectra of the recently manufactured nanoparticles reveal the presence of absorption peaks in an area spanning the wavelength range of 1000–2000 cm (Fig. 3). (see Fig. 3). This peak, which may be seen at a distance of around 1025 cm, may have an explanation that can be provided by the existence of the C–O–C– or –C–O– species. (Huang et al. 2007). The peak in the FTIR spectrum that was discovered at around 1628 cm1 was associated to the stretch vibration of –C=C– (Huang et al. 2007), as well as the amide I bonds that are present in proteins (Sastry et al. 2003). It is possible that the solution includes nitrogen dioxide given that there is a visible spike in the peak at around 1390 cm (NO3). (Luo et al. 2005).

If the peak at 1452 cm1) is generated by symmetric stretching vibrations of –COO– groups of amino acid residues in the protein that contain free carboxylate groups, then it is conceivable that this is the case. This is because free carboxylate groups are included in amino acid residues. 2 3. (Shivshankar et al. 2004a,b) Processing the extract of the fungal cell is necessary in order to remove heterocyclic chemicals and proteins from the extract of the fungal cell before it can be used in the production of capping ligands for nanoparticles. These heterocyclic compounds and proteins have structures that include bonds or functional groups such as -C-O, -C-O, and -C=C-. (Sastry et al. 2003; Shivshankar et al. 2004a; Huang et al. 2007). The examination that was carried out using a SEM micrograph revealed the presence of aggregations of silver nanoparticles, in addition to the spherical nanoparticles of silver that were already present. The spherical silver nanoparticles occupied a size range that was somewhere between 60 and 80 nanometers, with their average size falling somewhere in the middle of this range. The findings of Sadowski and colleagues (2008), who found that drying causes the nanoparticles to aggregate to some degree, are supported by the findings of this study, which obtained evidence to back up their claims. Sadowski and colleagues (2008) found that drying causes the nanoparticles to aggregate to some degree. They made this discovery after observing that drying leads the nanoparticles to cluster together into bigger groups. It has been shown that silver is the most effective nanosized antibacterial agent owing to its ability to fight not only bacteria and viruses, but also eukaryotic microorganisms. This ability to fight all types of microorganisms has made silver the most effective nanosized antibacterial agent. As a result, silver is the nanosized antibacterial agent with the greatest degree of versatility. One other benefit of utilizing silver is that it is a very excellent conductor of electricity, which is owing to the fact that silver is a very good electrical conductor (Feng et al. 2000; Morones et al. 2005). In a study conducted by Sondi and Salopek-Sondi (2004), the researchers found that Ag-NPs had an antibacterial impact against E. coli. As a direct consequence of this finding, it has been proposed that Ag-NPs may be used in the production of brand new antibacterial medications. [There is probably more than one reference for this] Kim et al. conducted studies to determine whether or not Ag-NP was successful as an antibacterial agent in combating Staphylococcus aureus and E. coli (2007). In their research, Sondi and Salopek-Sondi (2004) found that the antibacterial activity was much more efficient against Ps. aeruginosa and E. coli than it was against other kinds of germs. On the other hand, Shahverdi and colleagues (2007) found that the antibacterial activity was more effective against Staphylococcus aureus than it was against other kinds of pathogens. In the meanwhile, there is an urgent need for more study to evaluate whether or not these nanoparticles have the potential to be used in the manufacture of a bactericide that is more powerful against additional Gram-positive and Gram-negative bacteria. Finding out whether or not these nanoparticles have the capability of being used in the development of a bactericide is one way to go about accomplishing this goal.

CONCLUSION

It has been postulated that P. glomerata could play a role in an essential biological process that culminates in the production of silver nanoparticles (also known as Ag-NPs). In the course of the investigation that was carried out using the FTIR, proof that the Ag-NPs had been capped was discovered. It is hypothesized that the stability of Ag-NPs in a colloidal solution would considerably increase as a direct result of this incorporation, and this hypothesis is based on the fact that this incorporation involves the usage of capped Ag-NPs. It is possible that drug delivery systems will find them to be more appealing as a result of the biological molecules that are acting as a barrier between them and the outside world. An impact that was bactericidal against a broad range of pathogens was produced as a consequence of the creation of Ag-NPs. Antibiotics and antimicrobial nanoparticles are two examples of methods that may still be used to eradicate antibiotic-resistant organisms via the usage of antibiotics. Because P. glomerata has the ability to be used in the manufacture of nanoparticles, the issue of chemical agents that have the potential to have undesirable impacts on the application of nanoparticles may potentially be handled as a result. If this is the case, then the P. glomerata problem might

potentially be used in the production of nanoparticles. If we were to take this step, it would be a tremendous leap in the right direction, and we should definitely consider doing so.

REFERENCES

1. Ahmad, A., Senapati, S., Khan, M.I., Kumar, R. and Sastry, M. (2003) Extracellular biosynthesis of monodisperse gold nanoparticles by a novel extremophilic actinomycete, Thermonospora sp. Langmuir 19, 3550–3553.

2. Bansal, V., Ahmad, A., Sastry, M. and Rautray, D. (2004) Biosynthesis of zirconia nanoparticles using the fungus Fusarium oxysporum. J Mater Chem 14, 3303–3305.

3. Basavaraja, S., Balaji, S.D., Legashetty, A., Rasab, A.H. and Venkatraman, A. (2008) Extracellular biosynthesis of silver nanoparticles using the fungus Fusarium semitectum. Mater Res Bull 43, 1164–1170.

4. Bauer, A.W., Kirby, M., Sherris, J.C. and Turck, M. (1966) Antibiotic susceptibility testing by a standardized single disk method. Am J Clin Pathol 45, 493–496. Beveridge, T.J. and Murray, R.G.E. (1980) Site of metal deposition in the cell wall of Bacillus subtilis. J Bacteriol 141, 876–887.

5. Bhainsa, K.C. and D'Souza, S.F. (2006) Extracellular biosynthesis of silver nanoparticles using the fungus Aspergillus fumigatus. Coll Surfaces B: Biointerfaces 47, 160–164.

6. Bhattacharya, D. and Gupta, R.K. (2005) Nanotechnology and potential of microorganisms. Crit Rev Biotechnol 24, 199– 204.

7. Chen, J.C., Lin, Z.H. and Ma, X.X. (2003) Evidence of the production of silver nanoparticles via pretreatment of Phoma sp. 3Æ2883 with silver nitrate. Lett Appl Microbiol 37, 105–108.

8. Dameron, C.T., Brus, L.E., Caroll, P.J., Korton, A.R., Mehra, R.K., Reese, R.N., Steigerwald, M.L. and Winge, D.R. (1989) Biosynthesis of cadmium sulfide quantum semiconductor cryastallits. Nature 338, 596–597.

9. Duran, N., Alves, O.L., De Souza, G.I.H., Esposito, E. and Marcato, P.D. (2007) Antibacterial effect of silver nanoparticles by fungal process on textile fabrics and their effluent treatment. J Biomed Nanotechnol 3, 203–208.

10. Feng, Q.L., Wu, J., Chen, G.Q., Cui, F.Z., Kim, T.N. and Kim, J.O. (2000) A mechanistic study of the antibacterial effect of silver ions on Escherichia coli and Staphylococcus aureus. J Biomed Mater Res 52, 662–668.

11. Fortin, D. and Beveridge, T.J. (2000) In Biomineralization. From Biology to Biotechnology and Medical Applications. (ed. Baeuerien, E.), pp. 7, Weinheim: Wiley-VCH.

12. Gade, A.K, Bonde, P.P., Ingle, A.P., Marcato, P.D., Duran, N. and Rai, M.K. (2008) Exploitation of Aspergillus niger for fabrication of silver nanoparticles. J Biobased Mater Bioenergy 2, 243–247. Huang, J., Chen, C., He, N.,

13. Hong, J., Lu, Y., Qingbiao, L., Shao, W., Sun, D. et al. (2007) Biosynthesis of silver and gold nanoparticles by novel sundried Cinnamomum camphora leaf. Nanotechnology 18, 105–106. Ingle, A., Gade, A., Pierrat, S., Sonnichsen,C. and Rai, M. (2008) Mycosynthesis of silver nanoparticles using the fungus Fusarium acuminatum and its activity against some human pathogenic bacteria. Curr Nanosci 4, 141–144. Joerger, R.,

14. Klaus, T. and Granqvist, C.G. (2000) Biologically produced silver-carbon composite materials for optically functional thin film coatings. Adv Mater 12, 407–409. Kim, J.S., Kuk, E., Yu, K.N., Kim, J.H., Park, S.J., Lee, H.J.,

15. Kim, S.H., Park, Y.K. et al. (2007) Antimicrobial effects of silver nanoparticles. Nanomedicine 3, 95–101.

16. Klaus-Joerger, T., Joerger, R., Olsson, E. and Granqvist, C.G. (2001) Bacteria as workers in the living factory: metal accumulating bacteria and their potential for material sciences a review. Trends Biotechnol 19, 15–20. Klaus, T., Granqvist, C.G.,

17. Joerger, R. and Olsson, E. (1999) Silver-based crystalline nanoparticles, microbially fabricated. Proc Natl Acad Sci 96, 13611–13614.

18. Kowshik, M., Vogel, W., Urban, J., Kulkarni, S.K. and Paknikar, K.M. (2002a) Microbial synthesis of semiconductor PbS nanocrystallites. Adv Mater 14, 815–818.

19. Kowshik, M., Deshmukh, N., Kulkarni, S.K., Paknikar, K.M., Vogel, W. and Urban, J. (2002b) Microbial synthesis of semiconductor CdS nanoparticles, their characterization, and their use in fabrication of an ideal diode. Biotechnol Bioeng 78, 583–588.

20. Kowshik, M., Ashataputre, S., Kharrazi, S., Kulkarni, S.K., Paknikar, K.M., Vogel, W. and Urban, J. (2003) Extracellular synthesis of silver nanoparticles by a silver-tolerant yeast strain MKY3. Nanotechnology 14, 95–100.

21. Labrenz, M., Druschel, G.K., Thomsen, E.T., Gilbert, B., Welch, S.A., Kemner, K.M., Logan, G.A., Summons, R.E., Stasio, G.D., Bond, P.L., Lai, B., Kelly, S.D. and Banfield,

22. J.F. (2000) Formation of sphalerite (ZnS) deposits in natural biofilms of sulfate-reducing bacteria. Science 290, 1744–1747.

23. Li, S., Shen, Y., Xie, A., Yu, X., Qiu, L., Zhang, L. and Zhang, Q. (2007) Green synthesis of silver nanoparticles using Capsicum annum L. extract. Green Chem 9, 825–858.

24. Lovley, D.R., Stolz, J.F., Nord, G.L., Jr and Phillips, E.J.P. (1987) Anaerobic production of magnetite by a dissimilatory iron-reducing microorganism. Nature 330, 252–254.
25. Luo, L., Yu, S., Qian, S. and Zhou, T. (2005) Large-scale fabrication of flexible silver/ cross-linked poly (vinyl alcohol) coaxial nanoscale by a facial solution approach. J Am Chem Soc 127, 2822–2823.
26. Mihail, C.R. (2003) Nanotechnology: convergence with modern biology and medicine. Curr Opn Biotechnol 14, 337–346. Morones, J.R., Elechiguerra, J.L., Camacho, J.B. and Ramirez, J.T. (2005) The bactericidal effect of silver nanoparticles. Nanotechnology 16, 2346–2353.
27. Mukherjee, P., Ahmad, A., Mandal, D., Senapati, S., Sainkar, S.R., Khan, M.I., Ramani, R., Purisecha, R. et al. (2001) Bioreduction of AuCl4 ions by the fungus, Verticillim species and surface trapping of the gold nanoparticles formed. Angew Chem Int Ed Engl 40, 3585–3583.
28. Nair, B. and Pradeep, T. (2002) Coalescence of nanoclusters and formation of submicron crystallites assisted by Lactobacillus strains. Cryst Growth Des 2, 293–298.
29. Philipse, A.P. and Maas, D. (2002) Magnetic colloids from magnetotactic bacteria: chain formation and colloidal stability. Langmuir 18, 9977–9984.
30. Robinson, M., Brown, L.N. and Beverley, D. (1997) Effect of Gold (III) on the Pauling Diatom Amphora ceffeaeformisuptake, toxicity and interactions with copper. Biofouling 11, 59.
31. Roh, Y., Bai, J., Lauf, R.J., Mcmillan, A.D., Phelps, T.J., Rawn, C.J. and Zhang, C. (2001) Microbial synthesis of metal-substituted magnetites. Solid State Commun 118, 529–534. Sadowski, Z., Maliszewska, I.H., Grochowalska, B., Polowczyk, I. and Kozlecki, T. (2008) Synthesis of silver nanoparticles using microorganisms.
32. Mater Sci Poland 26, 419–425. Sastry, M., Ahmad, A., Khan, M.I. and Kumar, R. (2003) Biosynthesis of metal nanoparticles using fungi and actinomycetes. Curr Sci 85, 162–170.

Citation:Olawole O Obembe, “Fabrication of Silver Nanoparticles by Phoma Glomerata and its Combined Effect Against Escherichia Coli, Pseudomonas Aeruginosa and Staphylococcus Aureus”, American Research Journal of Biotechnology, Vol 1, no. 1, 2022, pp. 24-31.

Copyright © 2022 Olawole O Obembe, This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.