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Momordica Cymbalaria Plant Tubers Using Silver Nanoparticles Synthesis and Applied for The Biological Activity

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Abstract: **The present works at an aqueous extract of fresh fruits of *Momordica cymbalaria* is used for the synthesis of silver nanoparticles (Ag NPs), due to their applied for the biological activity in four pathogens. The tuber of *Momordica cymbalaria* plant belongs to the family Cucurbitaceace, the plant contains many medicinal property and nutritious plant. The tuber extract is to treat the diabetes, rheumatism, ulcer, diarrhea, skin diseases and abortion. The fruit extract has a lot of nutrients present like vitamins, calcium, potassium, sodium, antioxidants, flavanoids, saponin, cucubritacins, and quercetin. The silver nanoparticles synthesis method is a biological method, its cost effective and ecofriendly in the environment. After the synthesized NPs are characterized through XRD, FTIR, UV- Vis and SEM analysis. The UV visible spectroscopy, the strong and sharp absorption peak presents at 428 nm and the FTIR region of finger printing at - unique presence of bioactive compounds which play a key role in reduction of Ag NPs. The XRD results reveals that the spherical in shape and size of the Ag NPs is 71 nm and the hkl planes are compared to the International card no (JCPDS 04 -0783). The particle size of the SEM results of shape of the particles is spherical shape and the size of the particle is 5 nm. Finally the synthesized nanoparticles are applied for antibacterial activity.**

Keywords: *Momordica cymbalaria*, Silver nanoparticles, antibacterial activity, pathogens

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I. INTRODUCTION

The nanomaterials are attached the reduction in size of the material and improves its functional properties through change in optical, electrical and other related properties in the research (Roduner, 2006, Mohandes *et al.,* 2010). The envisages of intense research for the synthesis of nanomaterials through different approaches are such as physical, chemical and biological methods (Chehroudi, 2006). Now a day's biological mode of nanopartilce synthesis are popularized because of their viability, safe and biocompatible in nature.

The emerging field of nanotechnology is an explosive growth of nanotechnology in the fast years, the new strategies for the synthesis of nanometrials and new tools for the characterization and manipulation of nanotechnology. The sizes of the nanoparticles are referred as 1-100 nm (Rai *et al*., 2009, Jeevanadam *et al.*, 2017). Nanotechnology offers a new solution of biosystems and provides a broad technological platform for the application in many areas such as bioprocessing, industry, molecular medicine, agriculture etc. The nanoparticles are viewed by building blocks of nanotechnology (Saha *et al*., 2017) and nanotechnology play a important role in a variety of fields such as advanced materials, pharmaceuticals and environmental detection and monitoring. The nano powder is microscopic particles whose size is measured in nanometers nm 1nm= 10^{-9} m. It is the most unicellular organisms well knows such as bacteria and algae are capable of synthesizing inorganic materials, both intracellular nanoparticles synthesis and extracellular nanopartilces synthesis.

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A few strategies are utilized biological methods of silver nano-particles synthesized in which could be physical, chemical and biological method (Jaison et al., 2015). The physical and chemical methods are utilized as the combination of Ag NPs is dangerous chemicals in which is used for the synthesis. In this route of eco-accommodating method and the combination of Ag NPs are referred as a green synthesis method which is favored traditional methods because it is ecofriendly savvy, one step strategy that could be effective method for pig combination and doesn't usage of high weight, high temperature, high vitality and harmful synthesis (Saha *et al*., 2017).

Numerous scientists can be reported the various biological nanomaterials viz plant leaves extract, root extract, steam extract, bark extract, bud extract and latex extract (Mariselvam *et al*., 2014), microorganisms like bacteria (Saifuddin *et al*., 2009), fungi (Bhainsa, 2006) and enzymes (Willner *et al*., 2007) for the green synthesis of nanopartilces and a great deal of nanoparticles synthesis in which could be done on green synthesis of nanoparticles. The capping reagent are act as utilizing microbes, parasites and plants on account of their cancer prevention agent properties, medicinal field etc. (Ahmed *et al*,. 2015, Awwad and Ahmad (2014).The main reason for selecting the *Momordica cymbalaria* plant tubers contains reducing agent to play a important role in biosynthesis of Ag nanoparticles (Sunil *et al.*, 2012).

II. Experimental

i) Materials

Preparation of *Momordica cymbalaria* tuber extract

Fresh tubers were collected and completely washed with tap water to remove the surface of the tuber. The 1 ml of tuber extract were mixed to 10ml of distilled water and boiled for 10 min (Roy *et al*., 2017). The extracts were stored at room temperature and filtered and use the further use. The tuber extract role act as a better reducing agent and capping agent. The synthesis of Ag NPs was synthesizerd through biological method employing tuber extract and followed by the synthesized silver nanoparticles (Ag NPs) (Figure 1) was characterized in XRD, FTIR, UV, SEM and EDAX. The potential application on Ag NPs was assessed anti - bacterial study for four pathogens.

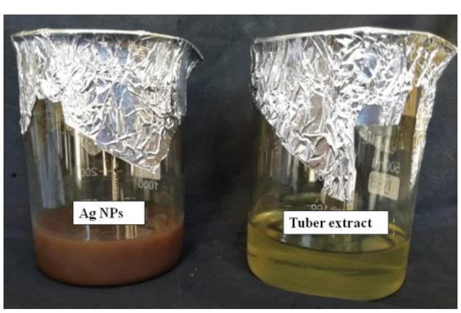

Figure 1: Biosynthesis of silver nanoparticles using tuber extract of *Momordica cymbalaria* plant

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III. Results and Discussion

i) XRD Study

The XRD techniques are used to calculate the particle size and XRD pattern of profile of synthesized AgNPs are presented in Figure 2. The size of the NPs was determined using Debye-Scherrer's formula Hargreaves (2016).

$$D = K \lambda / \beta \cos \theta$$

Where D is the crystal size of the nanoparticles, λ is the wavelength of radiation of the nanoparticles (λ = 0.15406 nm), K is 0.9 β is width of half maxium height of nanopartilces. The 2θ values of seven peaks 38.3182, 44.4975, 64.6119, 77.5385 and 81.6839 θ values are corresponding to hkl planes are 111, 200, 220 and 311 AgNPs are compared with JCPDS card no at 04-0783 and size of the crystalline was 71 nm (Lanje *et al*., 2010 and Das *et al*., 2009) to compare the tuber extract size is 110 nm.

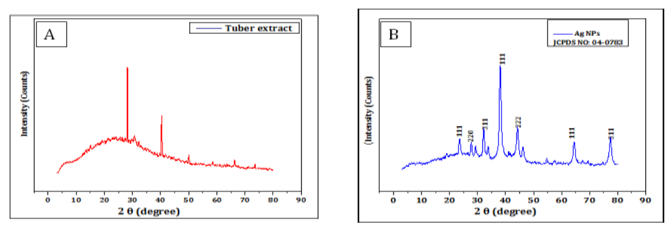


Figure 2: XRD pattern of Ag NPs synthesised using A) Tuber extract B) Ag Nanoparticles

ii) FT-IR analysis

The FTIR analysis is standard tool to use for the identification of potential biomolecules present different nanoparticles synthesized using biological reducing agents. FTIR spectrum obtained for Ag NPs in the present study confirm the presence of many potential biomolecules as shown in Figure 3. The FTIR spectra shows distinct bands indicate the results are unique presence of bioactive compounds which play a key role in reduction of Ag NPs. In a study, the metal bending vibration for biologically synthesized Ag NPs was well characterized (Park *et al*., 2006).

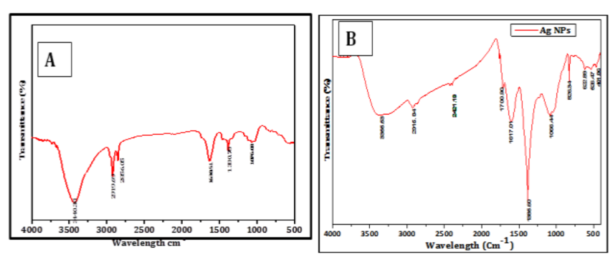


Figure3: FTIR spectrum A) Tuber extract B) Ag NPs synthesised using tuber extract

iii) UV- Visible Spectroscopic study

The UV- Visible spectroscopic study mostly used to the characterization of nanoparticles to reveal their optical and electronic structural properties. The formation of Ag nanoparticles, in the present study was the nanoparticles values in which are read at UV- Vis spectrophotometer. The reaction of silver nitrate solution under tuber extracts resulted in brown precipitate. The UV-Vis spectrum confirm the formation of Ag nanoparticles as absorbance peaks are observed at 200 - 800 nm and the strong broad surface Plasmon resonance peaks present at 428 nm (Figure 4).

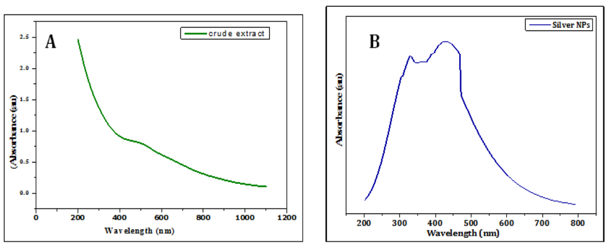
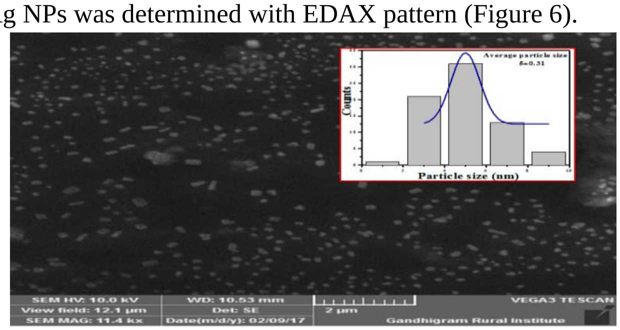


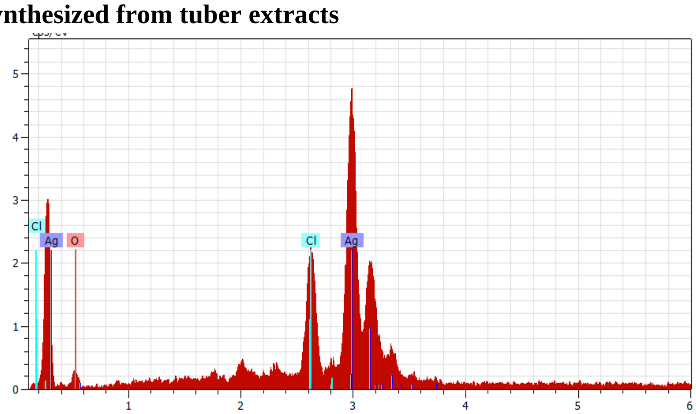
Figure 4: UV spectrum A) Tuber extract B) Ag NPs synthesized using tuber extract

iv) SEM imaging and EDAX profile

SEM images as observed in the present study clearly revealed that Ag nanoparticles appeared as spherical structures (Figure 5). Scanning electron microscopy study reveals the size and shape of the nanoparticles. The particle shape was spherical and size of the particle was 5 nm. EDAX studies also confirmed the signal characteristics of Silver and oxygen. The actual composition of Ag NPs was determined with EDAX pattern (Figure 6).



Figures 5: SEM imaging and Gaussian profile of Ag NPs synthesized from tuber extracts



Figures 6 (A - G): EDAX graph showing that Ag NPs elemental composition

v) Application of antibacterial activity

The biological activity of Ag NPs synthesized and evaluated for agar diffusion method using Muller Hinton Agar. The standard inhibition zone was measured in radius of zone and diameter of zone evaluated in *E.coli*, *Bacillus* sp, *Proteus* sp and *Salmonella* sp. The diameter of inhibition zone are against *E.coli* 12mm , *Bacillus* 10mm, *Proteus* 7mm and *Salmonella* 2mm. In order to results disclose the effective factors are on their antibacterial activity.

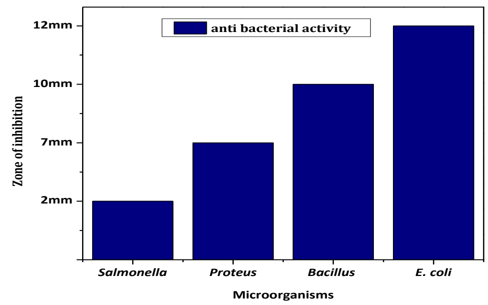


Figure7: Antibacterial activity for used various microorganisms in synthesized Ag Nanoparticles

Conclusion

In conclusion, the tuber extract has been used for ancient medicines for still now. So, the tuber extract has various bioactive compounds such as phenolic acids, flavonoids, carotenoids, cucurbitane, titerpenoid and phytosterol (Jha *et al.*, 2018). If there are all bioactive compounds it acts as a better reducing agent for the synthesis of Ag nanoparticles. It also a cost effective and ecofriendly material for the green route of synthesis Ag nanoparticles and the efficient route of tunable particle size to need not to use of high pressure, energy, temperature and toxic chemicals etc. Nanotechnology field is significant advances of synthesize Ag NPs are in spherical particles and size of the particles is 71 nm. The XRD, FTIR, UV- Vis, SEM and EDAX are characterized by Ag NPs and the application of Ag NPs is evaluated antibacterial activity.

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