

Bio synthesis of silver nanoparticles from leaf extract of *Andrographis paniculata* leaf extract and its antimicrobial, antioxidant, anticancer activities

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ABSTRACT

Medicinal herbs *Andrographis paniculata* belong to the family 'Acanthaceae' with nick name Kalmegh, Maha tita and Kalpanath. It is a plant that completes its life cycle in a single growing season that can develop from 30-100cm towering. Over the past twenty years, interest in medicinal plants has grown enormously from the use of herbal products as natural cosmetics and for self-medication by the general public to the scientific investigations of plants for their biological effects in human beings. Beyond this pharmaceutical approach to plants, there is a wide tendency to utilize herbal products to supplement the diet, mainly with the intention of improving the quality of life and preventing the diseases of elderly people. India has been identified as a major resourceful area in the traditional and alternative medicines globally. *Andrographis* herb possesses very potent cell and antiulcerogenic effects of *Andrographolide* (Madav et al., 1995).

Keyword: - *Andrographolide, antiulcerogenic, flavonoids, and Pholphana etc....*

1. INTRODUCTION

Andrographis paniculata is an annual, branched, herbaceous plant erecting to a height of 30-110cm in moist shady places. The stem is clear four crooked. Leaves are opposite, easy, glabrous, lanceolate, 2-12 cm long, 1-3cm wide with acute entire margin. Inflorescence is terminal and axillary in panicle, 10-30mm long with small bract and short pedicel. This is a generalization that applies to most leaves despite their endless variation in shape round, lobed, toothed and more. Blossoms are in lax, auxiliary and terminal racemes or panicles combined into a tetrahedron branch. A *paniculata* is dispence in tropical zone of Asia, India, Hong Kong, Thailand, Bangladesh and Singapore. It can be discovered in a different of dwelling, such as plains, mountain sides, coastal areas plow land such a way sides, farms and barren lands. The climatic requirement for the plant is heat and moist conditions with ample sunlight. Depending upon area of cultivation harvesting is done in October to November. The flowering and fruiting is done throughout the year especially from August to May.

2. PLANT PROFILE

Plant name: *Andrographis paniculata*

Common name: King of bitters

English name: creat

Scientific name: Green chiretta

Taxonomical classification:

Kingdom: plantae,

Division : Angiosperma
 Class: Dicotyledonae
 Order: persinales
 Family: Acanthaceae
 Genus: Andrographis
 Species: Andrographis paniculata



Fig 1: Andrographis paniculata

3. AIM AND OBJECTIVE OF THE STUDY

- To collect the leaves of Andrographis paniculata
- To synthesis Silver Nanoparticles
- To prepare the ethonolic leaf extract of Andrographis paniculata
- To perform the qualitative analysis of phytochemical screening
- To determine the free radical scavenging plant extract by DPPH
- To study the antimicrobial activity of alcoholic extract of Androgrpahis paniculata against the following bacterias
 Staphylococcus aureus
 Escherichia coli
- To evaluate the anti-cancer activity by MTT assay.

4. MATERIALS AND METHODS

The material and method of the present study on —Biosynthesis of silver Nanoparticles from leaf extract of Andrographis paniculata and its antimicrobial, antioxidant, anticancer activities

SYNTHESIS METHOD

Preparation of Andrographis Paniculata Leaf Extract

Andrographis paniculata leaves where collected in kangayam. The leaf was washed in many times with distilled water to remove the dust particles. Then the extract was prepared by taking 30g of leaf with grained in mortar. The leaf extract was green colour.

Synthesis of Leaf Capped AgNO₃ Nanoparticles

To synthesis AgNO₃ nanoparticles was taken in 500ml beaker the solution was stirred at 30minutes the 10ml leaf extract was mixed with AgNO₃ solution and this mixture was stirrer was for 30minutes by using magnetic stirrer. The colour solution was green colour obtained. The final product of AgNP's was tried at 70°C for 24hours. Thus settled precipitate was kept in microwave oven at 350watts for 25minutus the dried sample was grained in a mortar and then fine leaf capped AgNO₃ nanoparticle where obtained.

Microwave Irradiation Method

Microwave radiation is an alternative to conventional heating as a method to introduce energy into reactions. Microwave heating exploits the ability of some compounds (liquids or solids) to transform electromagnetic energy into heat. The use of microwaves as a mode of heating in situ has many attractions in Chemistry because, in contrast to conventional heating, its magnitude depends on the dielectric properties of the molecules. As a guide, compounds with high dielectric constants tend to absorb microwave radiation while less polar substances and highly ordered crystalline materials are poor absorbers. In this way absorption of the radiation and heating may be performed selectively. The use of microwave irradiation has led to the introduction of new concepts in Chemistry because the absorption and transmission of the energy is completely different from the conventional mode of heating. In addition, the shape and size of the sample in question can have an influence and these factors have an effect on the scale-up of some reactions.

CHARACTERIZATION TECHNIQUES

SEM (Scanning Electron Microscope)

SEM stands for scanning electron microscope. Electron microscopes use electrons imaging, in a similar way that light microscope use visible light. SEM use a specific set of scan the beam in a raster-like pattern and use the electrons that are reflected or knocked off the near-surface region of a sample to form an image. Since the wavelength of electrons is much smaller than the wavelength of light, the resolution of SEMs is superior to that a light microscope.

Fourier-transform infrared spectroscopy (FTIR)

FTIR spectroscopy is an analytical methodology used in industry and academic laboratories to understand the structure of individual molecules and the composition of molecular mixtures. FTIR spectroscopy uses modulated, mid-infrared energy to interrogate a sample. The infrared light is absorbed at specific frequencies related to the vibrational bond energies of the functional groups present in the molecule. A characteristic pattern of bands is formed, which is the vibrational spectrum of the molecule. The position and intensity of these spectral bands provide a fingerprint of molecular structure, making FTIR spectroscopy a highly adaptable and useful technique. FTIR spectroscopy is a great advance over the traditional dispersive infrared approach for a number of reasons including that the entire FTIR spectrum is collected in a fraction of a second and co-adding spectra, signal to noise is improved.

X – Ray Diffraction (XRD)

X-ray power diffraction is a rapid analytical technique primarily used for phase identification of a crystalline material and can provide information on unit cell dimension. The analyzed material is finely ground, homogenized and average bulk composition is determined.

Green Synthesis

Rapid industrialization and urbanization has led to the release of a large amount of hazardous, poisonous and unwanted chemicals, gases and substances causing not only a great deal of damage to the environment but also making life miserable on this beautiful planet earth. So there is a need to explore and learn more about the ways and means that are present in nature which could lead to the advancement in the synthesis process of Nano particles. Biological molecules are more suitable and less hazardous for Nanotechnology applications, because of their exclusive properties. They assemble themselves in highly controlled manner for the synthesis of reliable and eco-friendly metal Nano particles.

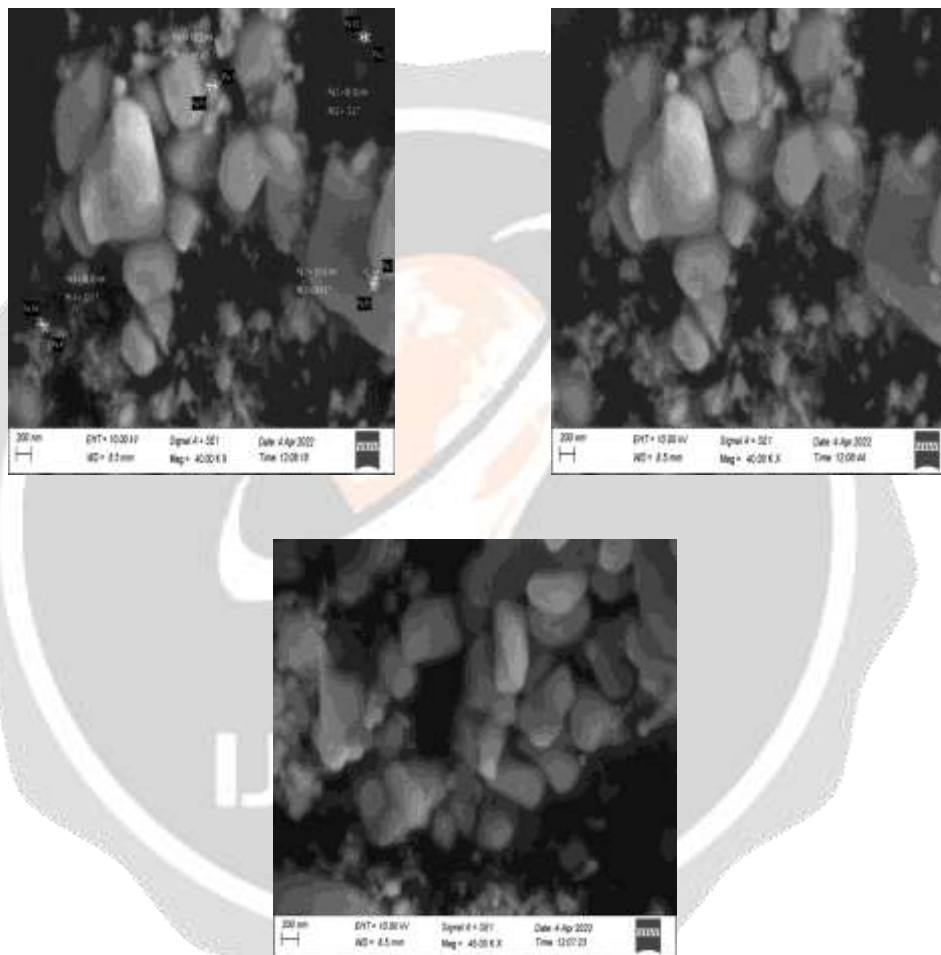
Synthesis of metal Nano particles is an important area of research due to their potential applications. Novel applications of Nano particles and Nano materials in various fields are emerging rapidly. Most of the chemical methods used for the synthesis of Nano particles are too expensive and they also involve the use of toxic, hazardous chemicals that are responsible for various biological risks. This enhances the growing need to develop environment friendly processes through green synthesis and other biological approaches. "Green synthesis" of Nano particles makes use of environment friendly and non-toxic reagents. A survey of green synthesis of thiazine and ox zines

revealed the moiety have attracted a great deal of interest of medicinal chemist, biochemist, and pharmacologist and rendered as a lead molecule for designing potential bioactive agents.

5. RESULTS AND DISCUSSION

SEM ANALYSIS

The morphological structure of the prepared nano composites was revealed SEM. The synthesized micrograph of MAS NP'S where crystalline in nature. The synthesized capped silver oxide NP'S (MAS) predicts non-spherical shape structure. The particle size of the AgNO₃ was 1µm to 200nm in diameter.



FTIR ANALYSIS

Spectroscopy is used to determine the nature of functional group present in the Ag Nanoparticles. The chemical structure of Ag Nanoparticles was observed in the range of 4000cm⁻¹ to 400cm⁻¹. The FTIR spectrum of AgNO₃Nanoparticles shows the stretching and vibrations 2923.51cm⁻¹ (OH-stretching(bonded)),2357.18cm⁻¹(O-H stretching),1712.24cm⁻¹(C=O stretching),1553.75cm⁻¹(N-H plane in bending),1378.82cm⁻¹(SO₂ asymmetric stretching),824.40cm⁻¹(S-O stretching),477.13cm⁻¹(S-S stretching),417.22cm⁻¹(out of plane Bending).

S.No	WAVE NUMBER cm ⁻¹	TYPE OF VIBRATION	INTENSITY
1	2923.51	OH-Stretching	Strong

2	2357.18	O-H Stretching	Strong
3	1712.24	C=O Stretching	Strong
4	1553.75	N-H plane in bending	Strong
5	1378.82	SO ₂ asymmetric	Strong
6	824.40	S-O Stretching	Strong
7	477.13	S-S Stretching	Strong
8	2924.01	O-H Stretching	Strong

XRD ANALYSIS

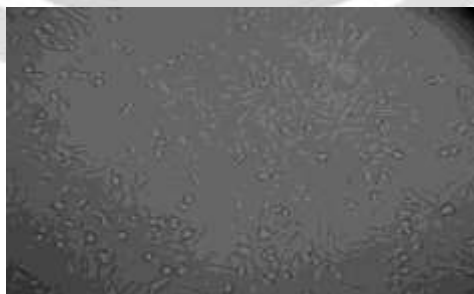
XRD pattern of AgNO₃ nanoparticles is shown in fig. the spectra of X-RD indicates that the synthesis Ag Nano particles using Andrographis Paniculata leaf extract which confirms crystalline nature XRD peaks located a 2θ values 32.7567, 38.1304, 44.3238, 46.1625, 53.7788, 64.4528, 77.4001 corresponding to hkl (111), (200), (200), (220), (220),(220),(331),(311) and standard diffraction peaks shows the Cubic structure (JCPDS card No: 65-2871, 31-1238, 04-0783, 76-1489, 12-0793). The remaining minor peaks are crystalline organic molecules of Ag Nano particles, the Debye-Scherrer formula was used

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

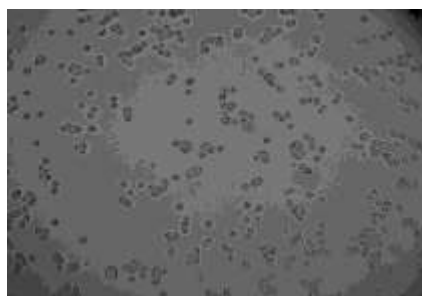
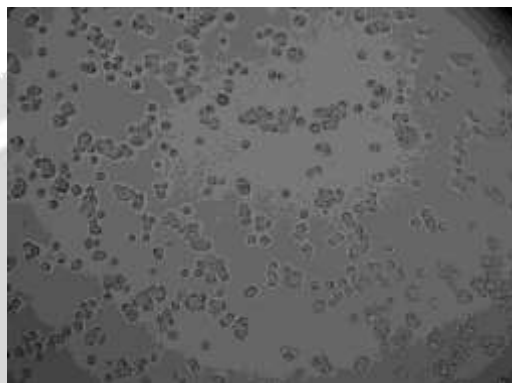
Anti-oxidant activity



HeLa cells (Control)-MAS



HeLa cells (Treated) –MTT

**Anti Cancer Property****Antimicrobial activity**

6. SUMMARY AND CONCLUSION

The present investigation was carried out in the ethanolic extract of *Andrographis paniculata* in terms of biosynthesis of silver AgNO₃ nanoparticle, phytochemical analysis, antimicrobial, antioxidant and anticancer property.

Presence of phytochemicals indicates possible preventive and curative properties *Andrographis paniculata* leaves. The ethanolic extract of *Andrographis paniculata* leaves contains alkaloids, carbohydrates, phytosterol, flavonoids, polyphenols, proteins and Aminoacids, terpenoids, triterpenoids. However, there is need to carry out more pharmacological studies to support the use of *Andrographis paniculata* as a medicinal plant.

Determination of natural antioxidant compounds of the plant extracts will help to develop new medicine constituents for anti-oxidant method like DPPH scavenging activity. From the results it was observed that leaf of *Andrographis paniculata* has good antioxidant activity. So it can be used for preventing or minimizing lipid oxidation in pharmaceutical products. This study shows that the ethanolic extract of leaf of *Andrographis paniculata*

have the antibacterial activity against *Staphylococcus E.coli*, and can be used as a source for developing broad spectrum antimicrobials.

Natural products found in medicinal plants have great promise for the treatment of cancer. According to anticancer study of *Andrographis paniculata* shows a effective property. The natural anticancer components present in this plant extracts used for therapeutic purpose. All the above observations of different activity of leaf extract *Andrographis paniculata* shows strong antioxidant activity, strong antibacterial and good anticancer activity. This could find the potential application in todays urban lifestyle which increases our exposure to various harmful oxidants.

The result of the study also supports the traditional applications of the plant materials for medicinal use. From this study, it may be concluded that the plant extract possess compounds with antimicrobial properties and be used as antibacterial agent. The study can be further extended to analyse the effect of leaf *Andrographis paniculata* in healthcare industry

7. REFERENCES

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