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GREEN SYNTHESIS AND CHARACTERIZATION OF SILVER NANOPARTICLES USING (*MURRAYA KOENIGII*) LEAF EXTRACT

K.SHILO SOWMYA GRACE
Assistant Professor of Chemistry
Department of Humanities & Sciences
Dr.K.V.Subba Reddy Institute of College Autonomous, Kurnool, India.

Abstract: Green Synthesis is an ecological system for the production of eco-friendly and well characterized metallic nanoparticles using plants. In this research work, the synthesis of silver nanoparticles was from the extract of *Murraya Koenigii* leaves and 1Mm of $AgNO_3$ Solution. The characterization of silver nanoparticles was done with Fourier Transform Infrared Spectroscopy (FTIR) to determine functional gropus.*Murraya Koenigii* can also be called as Bergera Koenigii belongs to Family Rutaceae, Commonly known as Curry leaves. It is popularly used as a Spice & Condiment among the Asians. Synthesized Silver nanoparticles was Confirmed by Sampling the reaction mixture at absorption maxima was scanned by FTIR range of 3500-1000 cm^{-1}.This green method provides faster synthesis comparable to chemical methods and can be used in areas such as Cosmetics ,food and medicinal applications.

Index terms: Silver nanoparticles, *Murraya Koenigii*, Plant extract, 1mM $AgNO_3$, FTIR.

Introduction:

Murraya Koenigii is Commonly Known as Curry leaves belongs the family Rutaceae Which is native to India and Srilanka.It is a Small tree, growing 4-6m (13-20 feet) tall, with a trunk up to 40 cm diameter. The leaves are fresh very pleasant and enhances the taste of the dish in which they are used. It have been widely used worldwide in Ayurvedic medicine for the treatment and prevention of Various diseases. It is commonly used in Culinary due to its aromatic quality. It is rich in many Vitamins and is used for treating Carminative and analgesic. It has anti-inflammatory, antioxidant, antitumor properties due to the presence of bioactive ingredients like Carbazole alkaloid. Various parts of this plant, such as Leaves, seeds and fruits, Contain constituents responsible for the modulation of numerous biological processes. Rutaceae, the family of flowering plants, is composed of 160 genera and a few Herbaceous Perennials of the 2070 global species belonging to the family Rutaceae, only a few herbaceous varieties[1]. The dark green fresh leaflets of *Murraya Koenigii* are widely used in Asian Cooking mainly for their aroma and Versatile medicinal properties .Various parts of *Murraya koenigii* are used to treat diabetes, Chronic fever, dysentery, and diarrhea.[2].The Leaves of *Murraya koenigii* are also used as a herb in Ayurvedic medicine, they are believed to possess anti-diabetic properties[3].The Leaves of *Murraya koenigii* are also used as a herb in Ayurvedic medicine .They are believed to possess anti-diabetic properties. The field of nanotechnology is one of the most active areas of research in modern material science[4]. Nanoparticles exhibit completely new based specific characteristics such as Size, distribution and morphology.

Fig 1: Fresh leaves of *Murraya Koenigii*

Fig 2: Dried leaves of *Murraya Koenigii*

NanoCrystalline silver particles have found tremendous applications in the field of high sensitivity bio molecular detection and diagnostics, antimicrobials and therapeutics catalysis and micro-electronics. Currently there are several methods for the productions of nanoparticles like chemical and physical methods. But there are evidences regarding the harmfulness of these methods to environment[5].Silver nanoparticles are more effective, because of the high surface volume fractions so that a large proportion of silver atoms are in direct contact with their environment[6].In reported the synthesis of silver and gold nanoparticles by using different plants and also found that plant system was more advantageous over other environmentally biological processes as it eliminates the elaborate process of maintaining cell cultures[7]. The wide spread use of chemicals has resulted in bacterial resistance to antibiotic: in such cases, Silver nanoparticles were found to be effective against multi-drug resistant bacteria. As a result of their Small Size, nanoparticles have a relatively large surface area in comparison to their volume. It has been suggested that the smaller the silver particles, the more effective the colloid[8]. Silver nanoparticles are supposed to be the new generation of antimicrobials as they are being used in many antimicrobial preparations[9].Reported the antibacterial activity of Silver nanoparticles synthesized by Fungi[10].

Successfully developed Silver nanoparticles impregnated wound dressings and textile fabrics that are useful for burn patients[11]. Silver nanoparticles (AgNPs) are also used for Surgical masks[12].It is used as a preservative for the prevention of growth of Pathogenic bacteria[13].

The rapid synthesis of silver and gold nanoparticles using *Murraya Koenigii* leaf extract[14].Curry leaves has recently been found to be a potent antioxidants due to high concentrations of Carbazoles, a water soluble heterocyclic compound[15]. *Murraya koenigii* Spreng normally called curry leaf or kari patta belongs to family Rutaceae. It has a special place in Indian cuisine for its characteristic aroma and potential health promoting properties.A variety of phytochemicals are isolated from its each part especially leaves. It is a rich source of carbazole alkaloid, bioactive coumarins and acridine alkaloid[16]. Metallic nanoparticles are of great importance in manyfields and applications such as medicine and electronics. This is because they have unique optical, electronic, chemical, and physical properties, and can be applied in drug delivery, catalysis, and sensing.[17] The use of

environmentally friendly materials such as plant extracts, fungi, bacteria, enzymes to produce AgNPs offers many benefits that are compatible with biomedical and pharmaceutical applications[18] .curative result from *M. koenigii* extract was observed in the reduction of silver ions into nanoparticles. Many literatures reported on the rapid synthesis of gold and Ag NPs from *M. koenigii* leaves extract[19]. Nanotechnology means handling of matter on an atomic and molecular scale. Generally, nanotechnology deals with the structure sized between 1 to 100 nanometer in at least one dimension and involved in developing materials or devices within that size[20]. Nanoparticles are made from noble metals; in particular Ag, Pt, Au, and Pd. Metal nanoparticles have marvelous applications in the area of catalysis, optoelectronics, diagnostic biological probes, and display devices. Among the above four silver nanoparticles play a major role in the field of biology and medicine[21]. The use of nano-sized silver particles as antimicrobial agents has become more common as technological advances make their production more economical [22]. Nanotechnology is mainly concerned with the synthesis of nanoparticles of variable sizes, shapes, chemical compositions and their potential use for human benefit[23]. In the recent years, noble metal nanoparticles have been the one of the focused research due to their unique optical, electronic, mechanical, magnetic, and chemical properties that are significantly different from those of bulk materials[24]. An advantage of the Japanese bunching onion is its rapid growth, creating a large bunch of leaves of delicate consistency, which contain a great amount of vitamin C, flavonoids and other ingredients important for health[25].

Materials and methods:

Sample Collection: The fresh Curry leaves (*Murraya Koenigii*) are collected from the Local shop area, Kurnool. The fresh leaves are collected in Zipper bag, later is washed with tap water and again rinsed with distilled water for 3 times to remove the impurities present in the curry leaves and weight were determined. Later the curry leaves are allowed to dried to sunlight without any water droplets for 2 days. The leaves are collected and crushed through Petri dish into smooth powder form. Now take 20gms of curry leaf powder into a Clean 500ml beaker and prepare 250 ml of solution by adding distilled water .Later they were boiled by using the Water bath for 20 mins. After boiling, the solution was allowed to cool and filtered through Whatman filter paper to get a clear solution which was stored at 4^{o}c for 24 hours for further use.

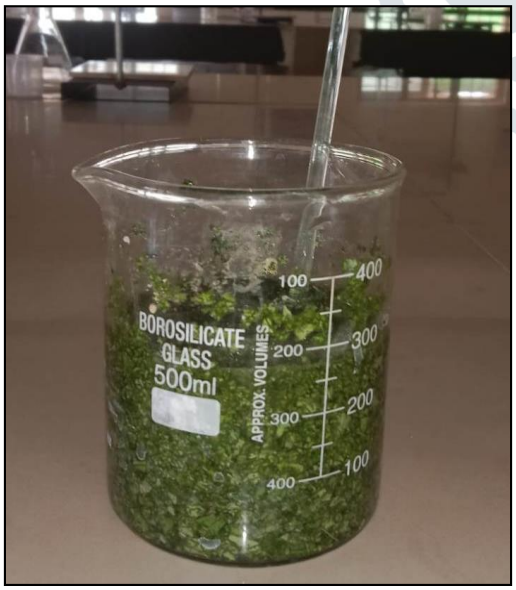

Fig 3: Residue of Dried leaves

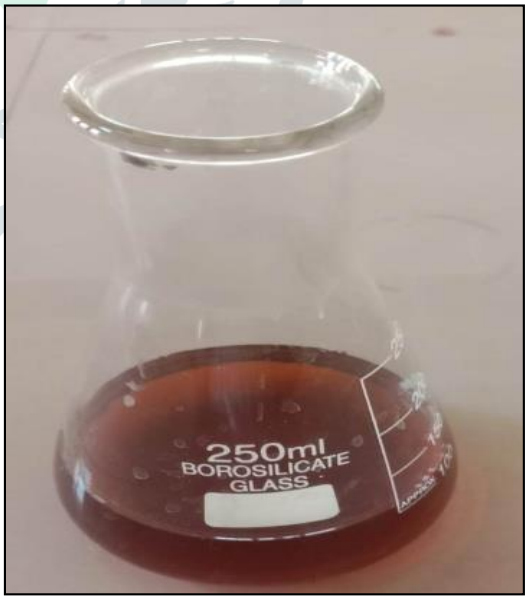

Fig 4: Extracts of Dried leaves

Synthesis of Silver Nanoparticles:

Silver Nitrate solution was prepared by dissolving 1mM of $AgNO_3$ and volume is made upto 250ml with distilled water. Now take five different test tubes and washed with distilled water. Add 2ml,4ml,6ml,8ml,10ml of filtrate of Curry leaves in test tubes of 1,2,3,4,5 respectively, Now add again add 5ml of 1mM $AgNO_3$ solution drop by drop with continuous stirring by glass rod. A gradual change is noticed from Colorless to Brown colour indicating the formation of Silver nanoparticles in different concentrations.

Results and Discussion:

Synthesis of Silver nanoparticles:

By the addition of $AgNO_3$ to leaf extract there will be an colour changes to dark brown which indicates the formation of Silver nanoparticles.

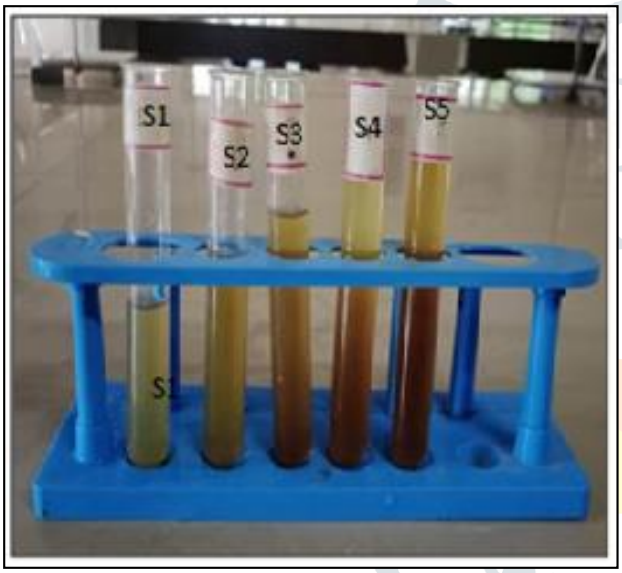

Fig 5: Addition of $AgNO_3$

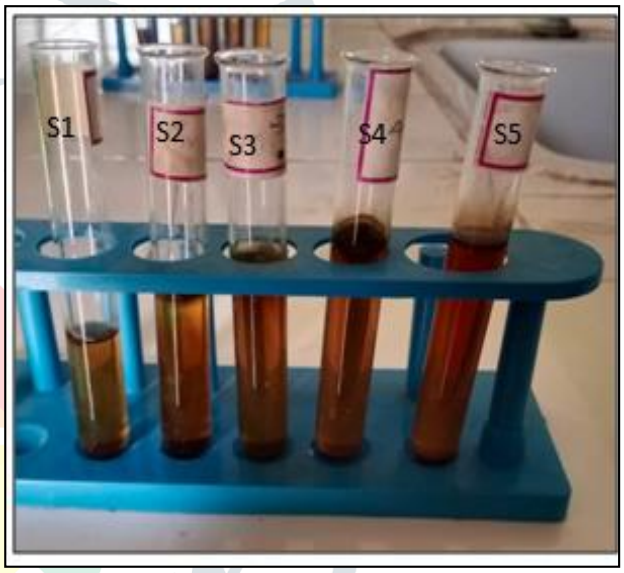

Fig 6: After 72 hours the Colour changes from pale yellow to dark brown

FTIR Analysis:

FTIR spectra were measured by Perkin Elmer spectrometer having a resolution of 1 cm^{-1} in the wavelength range 3500-1000 cm^{-1}.Figure shows the sharp FT-IR spectrum of synthesized AgNPs located at about 3414.61 cm^{-1},2090.76 cm^{-1},1641.89 cm^{-1} . Absorption peaks at 3414.61 cm^{-1}assigned to O-H stretching for alcohols and phenols, 2090.76 cm^{-1}assigned to Silicon compounds and 1641.89 cm^{-1} assigned to C=O stretching for tertiary amides These results confirms the presence of polyphenolic groups responsible of capping & stabilization of silver nanoparticles. IR spectroscopic study confirmed that carbonyl group form amino acid residues and proteins has the stronger ability to bind metal, could possibly form a layer covering the metal nanoparticles (i.e., capping of silver nanoparticles) to prevent agglomeration and thereby stabilize the medium .These results suggest that the biological molecules perform dual functions of formation and stabilization of silver nanoparticles in the aqueous medium.

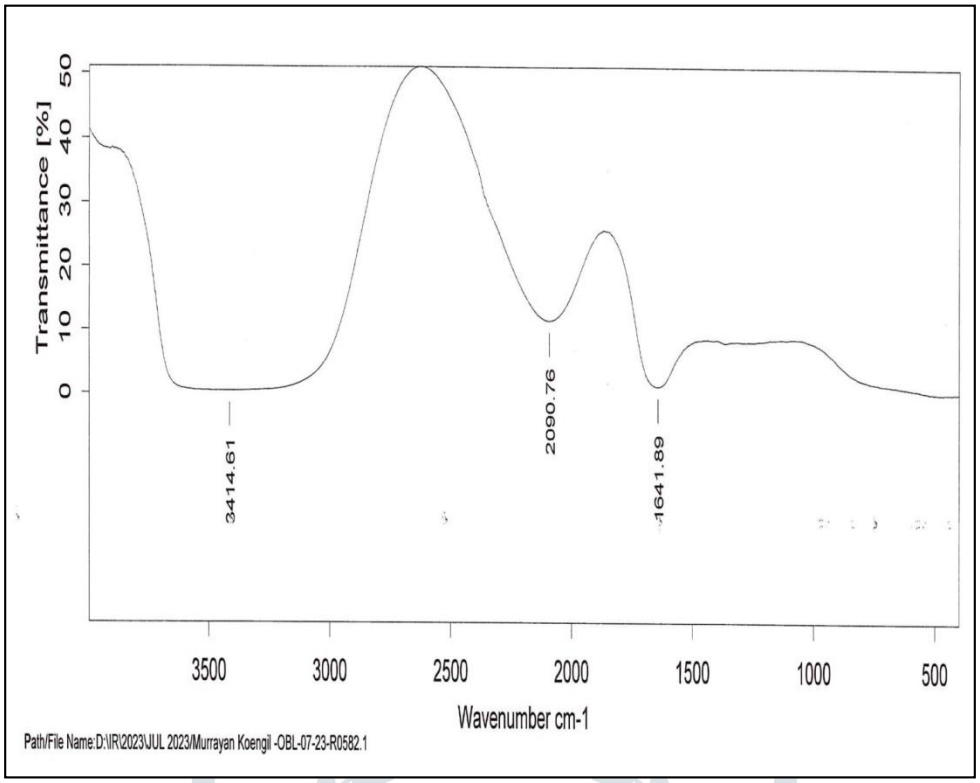

Fig.7:FTIR spectrum of synthesized AgNPs using *Murraya koenigii* leaf extract.

Conclusions:

The result showed that Curry leaves play an important role for the formation of AgNPs was confirmed through the FTIR study, which confirmed the emergence of different functional groups for different types of phytochemicals.It can be concluded that AgNPs formed because of the reduction and stability of agents in the *M.koenigii* leaf extract .

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