International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)
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Green Synthesis of Silver Nanoparticles by Flowers and It's Application

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ABSTRACT

Green synthesis of silver nanoparticle by flowers is an easy, efficient, economical, ecofriendly , biological synthesis approach. The biological synthesis of nanoparticle has provide a means for improved technique compared to the traditional method that uses the harmful reducing agents. Flowers have unique properties that are useful to synthesis nanoparticles. Chemical and physical Methods of synthesis are toxic and costly that reduce medicinal application. As compared to microbial nanoparticles are more stable and monodispersed and plant extract takes less time to reduce metal ions. Chemical and physical methods for the synthesis are toxic and very costly affects the medicinal application. Biogenic method of silver nanoparticle synthesis are eco-friendly and produced nanoparticle with the precise shape and size. To form the green synthesized silver nanoparticle by flower extract and used it in various application.

I. INTRODUCTION

Nanotechnology is a versatile field that deals with the study and application of materials at the nanoscale. Nanoparticles exhibit new and improved properties as compared to bulk counterparts due to change in their characteristics such as shape, size, size distribution and larger surface area to volume. Nowadays, metal nanoparticles have found many applications in the field of science and technology due to their unique electronic, mechanical, optical and magnetic properties In recent years, silver nanoparticles (AgNps) have greatly focused the researcher's attention because of their important application as antimicrobial, catalytic, textile fabrics and plastics to eliminate micro-organisms. Green synthesis of nanoparticles aims at minimizing generated waste and implementing sustainable processes. In recent years, green processes using mild reaction conditions and nontoxic precursors have been emphasized in the development of nanotechnology for promoting environmental sustainability. The main aim of green synthesis is to minimize the use of toxic chemicals to prevent the environment from pollution. The biogenic routes for the fabrication of nanomaterials are therefore becoming more and more popular. The three main conditions for nanomaterials preparation are the choice of environment-friendly solvent medium, environmental friendly reducing agent and a nontoxic material for their stabilization. Nanomaterials fabricated from plants, fungi and bacteria have several potential applications in all fields of science and technology. Nanocatalysis has undergone great prosperity in the past decade. One of the main branches of nanocatalysis is nanoparticle (NP) catalysis in liquid phase. NP catalysis in traditional solvents originated from colloidal chemistry that dated back to 19th century when Pt NPs were used to decompose hydrogen peroxide. Since 1990, it became an independent field usually called colloidal catalysis or quasi-homogenous catalysis since it was believed, at that time, to be a bridge between classical homogenous catalysis and heterogeneous catalysis. “Soluble” NPs in solution phase enabled the direct usage of in situ techniques such as in situ IR and in situ NMR, which were successfully used in homogenous complex catalysis for mechanistic studies . In some cases, NPs were the real active parts for the catalytic activity that molecular complexes generally showed . The higher efficiency of these NP catalysts under mild conditions, in comparison with that of traditional solid state catalysts, was therefore thought to be due to their higher dispersion in solvent and three-dimensional rotational freedom. Silver nanoparticles are important as they find applications in catalysis, organic transformations, synthesis of fine chemicals and organic intermediates. In this the synthesis of Ag nanoparticles, supported Ag nanoparticles and bimetallic Ag-metal nanoparticles and their characterization by various techniques. The applications of Ag nanoparticles in several organic transformations including C-C, C-N, C-S, C-O bond formation reactions as well as reduction and oxidation reactions are also discussed. The use of Ag nanoparticles in catalysis is advantageous as it avoids the use of ligands; easy separation of catalyst for recyclability makes the protocol heterogeneous and economic. Ag nanoparticles gave good catalytic activity towards desired products due to high surface area. By considering these advantages, researchers have focused their attention towards applications of Ag nanoparticles in catalysis.

II. METHODS AND MATERIAL

Catalysis of silver nanoparticles, among the metal-based nanoparticles, has been of great interest in organic synthesis and has expanded rapidly in the past ten years because of nanosilver catalysts' unique reactivity and selectivity, stability, as well as recyclability in catalytic reactions. As can be seen from the research results reported in this critical review, the application of heterogeneous silver-based nanoparticles to general organic reactions has been proven to be an effective strategy in the development of highly efficient organic transformations in terms of efficiency and selectivity. In this the strong potential of nanosilver catalysis in the total synthesis of natural products and pharmaceutical molecules.

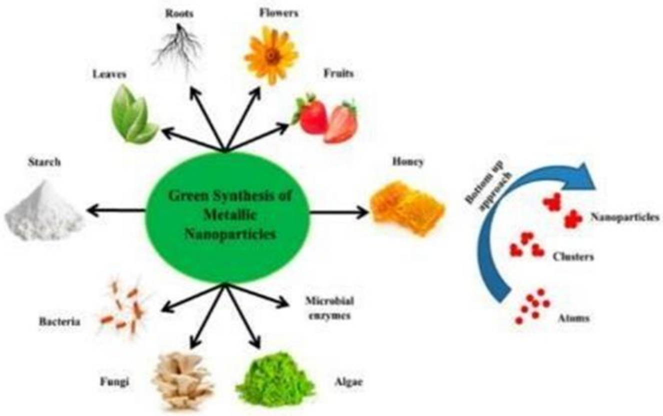


Figure 1. Different types of green synthesis used for the preparation of metal nanoparticles.

III. PREPARATION OF SILVER NANO-PARTICLES

Green-synthesized NPs can be obtained through an easy, efficient, economical and eco-friendly biological synthesis approach. Metallic nanoparticles can be obtained from cell or cell-free extracts of a variety of biological resources, as The key factor that should be considered during the nanoparticle preparation is that it should be evaluated against green chemistry principles, like the selection of a solvent medium, eco-friendly reducing agent, and non-toxic material for nanoparticle stabilization. Furthermore, compounds like peptides, polyphenolics, sugars, vitamins, and water from coffee and tea extracts were found to be appropriate for the synthesis of nanoparticles. As compared to microbial NPs, plant-based NPs are more stable and monodispersed, and plant extract takes less time to reduce metal ions. Microbial synthesis is one of the approaches to the synthesis of nanomaterials. Beside it Flowers have unique chemical properties that can be useful for nanoparticle synthesis. The synthesis of flowermediated NPs is has various advantage, as compared with other biological NPs synthesis methods, like particularly the one mediated through microorganisms, that microorganisms need to be maintained or cultured under aseptic and pure culture conditions. It is a difficult task to separate nanoparticles during the downstream processing of microbial broth cultures. Furthermore, it takes more time to convert soluble metallic salts to elemental or element oxide NPs. A generalized mechanism for the biosynthesis of different nanoparticles using flower

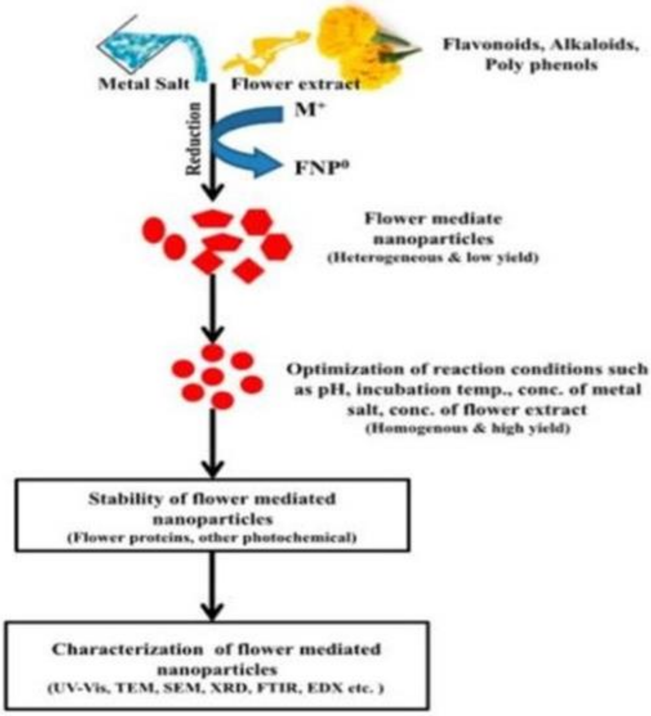


Fig 2. Green synthesis of Silver nanoparticles.

Silver nanoparticles (AgNPs) show a considerably large surface area, which leads to a significant biochemical reactivity, catalytic action, and atomic behavior, when compared with large particles with an identical chemical configuration. The synthesis of noble AgNPs is a two-step procedure that first involves the reduction of Ag+ ions to Ago, and after this agglomeration and stabilization is completed, the synthesis involves the development of oligomeric clusters of colloidal AgNPs. The reduction procedure occurs in the presence of biological catalysts. The flower-derived AgNPs have shown numerous applications. Silver Nanoparticles (AgNPs) show a considerably large surface area, which leads to a significant biochemical reactivity, catalytic action, and atomic behavior, when compared with large particles with an identical chemical configuration. Flower which is used for synthesis of silver nanoparticle was flower belonging to family Apocynaceae*Catharanthusroseus* which have the high amounts of Flavonoids, alkaloids polyphenol. The extract of flower is prepared that gets mixed with the silver metal salt as a result the reduction of Ag^+ ions to Ag^0 take place later on the reaction conditions are get maintained and we get the stable nanoparticle which are get analysed by various characterization technique. The flower is used in nanomaterial is Catharanthusroseus, commonly known as bright eyes, Cape periwinkle, graveyard plant, Madagascar periwinkle, old maid, pink periwinkle, rose periwinkle, is a species offlowering plantin the family Apocynaceae. It is native andendemictoMadagascar, but grown elsewhere as an ornamental and medicinal plant, a source of thedrugsvincristineandvinblastine, used to treat cancer.

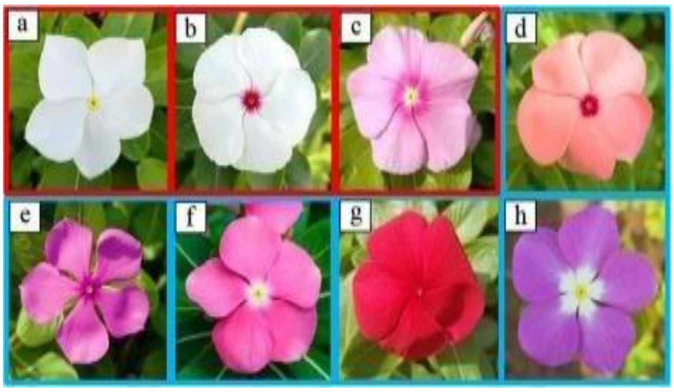
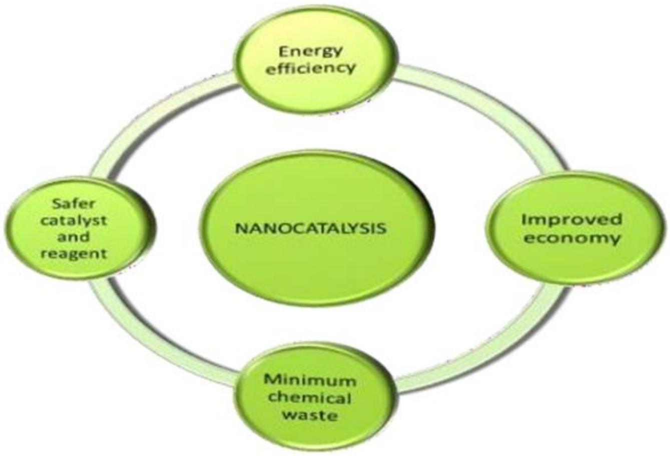


Fig3. Pictures of Catharanthus rosus

IV. RESULT AND DISCUSSION

Metallic nanoparticles synthesized from extracts of several flowers of a diverse size, shape, and surface areas are categorized using different approaches. The composition, size, structure, and crystal phase of the synthesized nanoparticles are deduced using UV–vis, XRD, FT-IR, DLS, EDS, and Raman spectroscopy. The range of the UV spectra wavelength, from 300 to 800nm, illustrates the existence of several metallic nanoparticles of a size ranging from 2nmto100nm. Usually, the detection of silver nanoparticles is conducted using UV spectroscopy in the range of 500 and580nm Estimation of the size of the synthesized nanoparticles, along with the quantification of the charges on the surface of the nanoparticles, is conducted using DLS analysis. The composition of the element is determined through EDAX analysis. XRD is performed to recognize the size of the crystallite. FT-IR spectroscopy is used to detect the residues on the surface and the functional groups- such as, phenols, and hydroxyls which bond with the surface of the nanoparticles throughout the process of the synthesis for an effective reduction and stabilization.



The use of biological materials for the production of nanoparticles has a great potential as a cost-effective and eco-friendly synthesis method for novel and innovative nanomaterials. Non- hazardous biological wastes also play a crucial role in green synthetic protocols for the generation of nanoparticles. The green chemistry approach is completely different from the conventional physical and chemical processes, which frequently utilize environmentally corrosive agents with the ability to cause cytotoxicity, environmental toxicity, and carcinogenicity. On the other hand, the flower-mediated green synthesis of NPs is a vigorous method that does not require any specific isolation and maintenance procedures, which are need in bacteria-,fungi-,oral ae-based nanoparticle synthesis approaches. Flower-induced nanoparticles can exhibit specialized properties, including antimicrobial, antioxidant, catalytic, and cytotoxic activities. The present study intends to highlight the potential of flower-derived metallic nanoparticles. Of all the studied nanoparticles, Au and AgNP[s] were shown to be the best potential nanoparticles in terms of their effective antibacterial, antioxidant, and insecticidal activities. Bio- accumulation and toxicity are the two challenges associated with green metallic nanoparticles that prevent their use as therapeutic agents in humans and that need to be resolved through scientific intervention. With further improvement, the flower-mediated green synthesis of nanoparticles may offer important, ecofriendly end products, with wide applications, as compared to the harsh and lethal procedures used at present for the synthesis of nanoparticles. Flower-induced nanoparticles can exhibit specialized properties, including antimicrobial, antioxidant, catalytic, and cytotoxic activities. The present study intends to highlight the potential of flower- derived metallic nanoparticles. Of all the studied nanoparticles, AgNPs were shown to be the best potential nanoparticles in terms of their effective antibacterial, antioxidant, and insecticidal activities. Bio-accumulation and toxicity are the two challenges associated with green metallic nanoparticles that prevent their use as therapeutic agents in humans and that need to be resolved through scientific intervention. With further improvement, the flower-mediated green synthesis of nanoparticles may offer important, ecofriendly end products, with wide applications, as compared to the harsh and lethal procedures used at present for the synthesis of nanoparticles.

V. CONCLUSION

Technical barriers are the obstructions that are involved during the synthesis of flower mediated nanoparticles. While green nanoscience has gained significant attention, efforts are still being made to standardized the protocols for the synthesis of uniform nanoparticles. Further advancements involving the use of tools and techniques for the scaled-up production of NPs through green synthesis need to be identified to design commercially feasible production technology at the industrial scale. Another pivotal issue regarding the large-scale use of green synthesized nanoparticles is nano-toxicity, which has to be addressed stringently.

The toxicology and analysis protocols have to be developed and updated constantly to reflect the need of the application. Furthermore, the uncertainty and ambiguity associated with the regulatory bodies and laws has to be clearly understood to allow for the use and commercialization of ecologically safe nano-based products. The end market demands need to be made clear, as there are only limited numbers of commercial grade products that can be compared to conventional materials in terms of performance. A unique idea, which still needs to be developed and established, is the use of flowers in the green synthesis of nanoparticles, as this research is still restricted to the synthesis of Au and Ag NPs. To further strengthen this field, it is important to create monodispersed nanoparticles—such as CdS, ZnO, TiO2, and Fe3O2. More studies are required to recognize the various components that may lead to the reduction of metal ions. In the literature, it has been reported that proteins are responsible for the equilibrium, but it is very difficult to recognize the proteins responsible for the functionalization of these nanoparticles.

VI. REFERENCES

[1]. Nanosilver as a new generation of silver catalysts in organic transformations for efficient synthesis of fine chemicals (RCS)-Xiao-Yun DongaZi-Wei Gao,aKe-Fang Yang,bWeiQiangZhanga and Li-Wen Xuab.

[2]. Flower-Based Green Synthesis of Metallic Nanoparticles: Applications beyond FragranceHarsh Kumar 1, Kanchan Bhardwaj 2 , KamilKucˇa 3, , AnuKalia 4, Eugenie Nepovimova 3, RachnaVerma 2 and Dinesh Kumar.

[3]. Khandel, P.; Shahi, S.K. Mycogenic nanoparticles and their bio-prospective applications: Current status and future challenges. J. Nanostruct. Chem. 2018, 8, 369–391.

[4]. Begum, R.; Najeeb, J.; Sattar, A.; Naseem, K.; Irfan, A.; Al-Sehemi, A.G.; Farooqi, Z.H. Chemical reduction of methylene blue in the presence of nanocatalysts: A critical review. Rev. Chem. Eng. 2019.

[5]. Shah, M.; Fawcett, D.; Sharma, S.; Tripathy, S.K.; Poinern, G.E.J. Green synthesis of metallic nanoparticles via biological entities. Materials 2015, 8, 7278–7308.

[6]. Li, G.; He, D.; Qian, Y.; Guan, B.; Gao, S.; Cui, Y.; Yokoyama, K.; Wang, L. Fungusmediated green synthesis of silver nanoparticles using Aspergillusterreus. Int. J. Mol Sci. 2012, 13, 466–476.

[7]. https://www.researchgate.net/figure/Photographs-of-eight-varieties-of-Catharanthus