

Herbal formulation mediated synthesis of silver nanoparticles and its antifungal activity

P. Vignesh, S. Rajeshkumar*

ABSTRACT

Aim: The aim of the study was to evaluate herbal formulation (*Andrographis paniculata* and *moringa olifera*) mediated synthesis of silver nanoparticles (AgNPs) and its antifungal activity. **Materials and Methods:** *Andrographis paniculata* and *Moringa olifera* formulated and used for green synthesis of AgNPs has been gaining importance due to its simplicity and eco-friendliness. In this study, the herbal formulation mediated AgNPs are evaluated for antifungal activity using agar well diffusion method. **Objective:** The objective of the study was to evaluate herbal-mediated synthesis of AgNPs and its antifungal activity.

KEY WORDS: Antifungal, Green synthesis, Nanoparticles

INTRODUCTION

The nanotechnology is the advance field having various applications in the field of information technology, computer science, dental products, electronics and communications, environmental technology, biomedical engineering and energy development. The different types of nanoparticles such as zirconium oxide, titanium oxide, graphene, gold, zinc oxide, copper oxide, silver, chitosan and hydroxyapatite are used in various products development. The green materials such as *Syzygium cummini*, *Coleus aromaticus*, Sunflower, *mangifera indica*, *Annona squamosa*, *Hydrilla verticillata*, *Lantana camara*, *Trianthema decandra*, *Elettaria cardamom*, pomegranate extract *Millingtonia ortensis*, *Coleus aromaticus*, *Cissus quadrangularis*, *Vitis vinifera*, *Serratia nematodiphila*, *Piper nigrum* leaf and stem, *Solanum trilobatum*, *Pongamia pinnata*, *Boerhaavia diffusa* Leaves, *Ipomoea mirabilis jalapa*, *Solanum nigrum*, *Chrysanthemum indicum*, *Padina tetrastromatica*, *Turbinariae conoides* and various a bacterial and fungal culture is used in nanoparticles synthesis.^[1-20]

MATERIALS AND METHODS

Preparation of Herbal Extract

Herbal leaves were collected from Chennai. The collected leaves were washed 3–4 times using distilled water then dried it in shade for 7–14 days. The well-dried leaves were made into the powder.

Green Synthesis and Antifungal Activity of Nanoparticles

The plant formulation (*A. paniculata* and *M. olifera*) 10 mL was added with 1 mM of 90 mL of silver nitrate solution and colour change was observed. The centrifuged silver nanoparticles solution was loaded in the wells of rose Bengal Agar plates. The zone of inhibition was observed after 48 h.

RESULTS AND DISCUSSION

The Figures 1-3 are clearly showing the antifungal activity of silver nanoparticles and green synthesis of silver nanoparticles using the plant formulation, UV-vis spectroscopic peak at 420 nm confirms the silver nanoparticles formation. Finally, the Petri plates are showing the antifungal activity of silver nanoparticles against fungal pathogens.

Access this article online

Website: jrsolutions.info

ISSN: 0975-7619

Department of Pharmacology, Nanobiomedicine Lab, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India

*Corresponding author: Dr. S. Rajeshkumar, Department of Pharmacology, Nanobiomedicine Lab, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 600 077, Tamil Nadu, India. E-mail: ssrajeshkumar@hotmail.com

Received on: 06-04-2019; Revised on: 09-06-2019; Accepted on: 19-07-2019

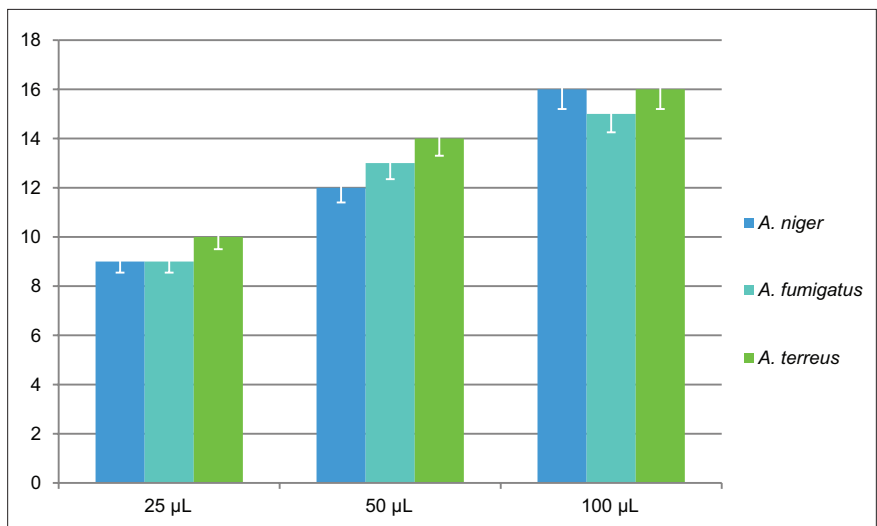


Figure 1: Antifungal activity of silver nanoparticles

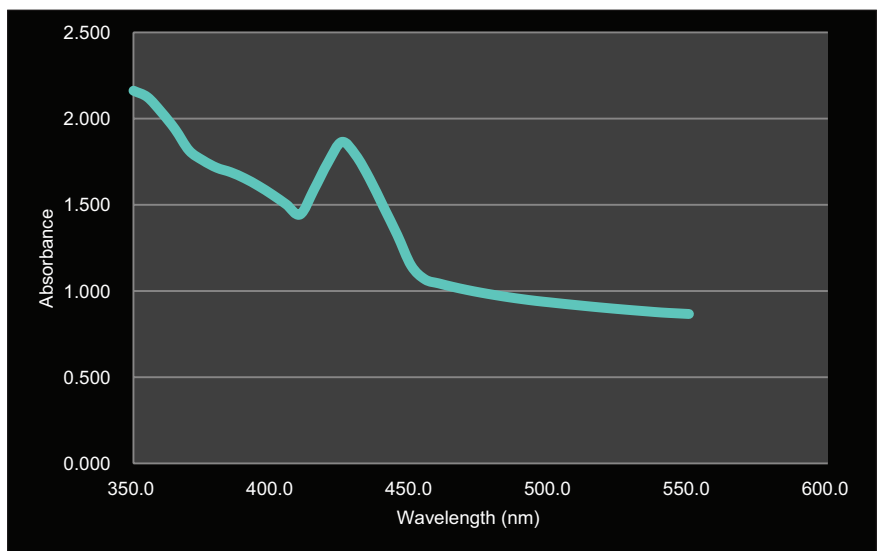


Figure 2: UV-vis spectroscopic analysis of AgNPs

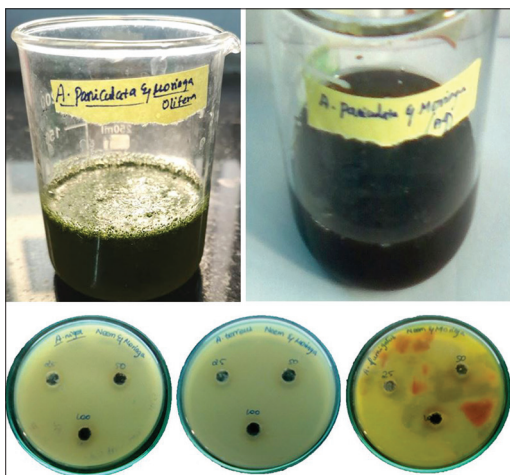


Figure 3: Plant extract and antifungal activity of AgNPs

CONCLUSION

The herbal formulation mediated silver nanoparticles are had very good antifungal activity against some fungal pathogens. In future it may be used in the controlling of disease causing fungal pathogens based products.

REFERENCES

- Gnanajobitha G, Vanaja M, Paulkumar K, Rajeshkumar S, Malarkodi C, Annadurai G, et al. Green synthesis of silver nanoparticles using *Millingtonia hortensis* and evaluation of their antimicrobial efficacy. *Int J Nanomater Biostruct* 2013;3:21-5.
- Gnanajobitha G, Rajeshkumar S, Kannan C, Annadurai G. Preparation and characterization of fruit-mediated silver nanoparticles using pomegranate extract and assessment of its

- antimicrobial activity. *J Environ Nanotechnol* 2013;2:4-10.
3. Vanaja M, Rajeshkumar S, Paulkumar K, Gnanajobitha G, Malarkodi C, Annadurai G. Phytoreduction of silver ions using stem and root extract of *Coleus aromaticus*. *Int J Mater Biomater Appl* 2013;3:1-4.
 4. Vanaja M, Gnanajobitha GD, Paulkumar K, Rajeshkumar S, Malarkodi C, Annadurai G. Phytosynthesis of silver nanoparticles by *Cissus quadrangularis* influence of physico-chemical factors. *J Nanostruct Chem* 2013;3:17.
 5. Malarkodi C, Rajeshkumar SS, Paulkumar K, Vanaja MM, Jobitha GG, Annadurai G. Bactericidal activity of bio mediated silver nanoparticles synthesized by *Serratia nematodiphila*. *Drug Invent Today* 2013;5:1-7.
 6. Gnanajobitha G, Paulkumar K, Vanaja M, Rajeshkumar S, Malarkodi C, Annadurai G, *et al.* Fruit mediated synthesis of silver nanoparticles using *Vitis vinifera* and evaluation of their antimicrobial efficacy. *J Nanostruct Chem* 2013;3:1-6.
 7. Vanaja M, Rajeshkumar S, Gnanajobitha G, Paulkumar K, Malarkodi C, Annadurai G. Kinetic study on green synthesis of silver nanoparticles using *Coleus aromaticus* leaf extract. *Adv Appl Sci Res* 2013;4:50-5.
 8. Paulkumar K, Gnanajobitha G, Vanaja M, Rajeshkumar S, Malarkodi C, Annadurai G. *Piper nigrum* leaf and stem assisted green synthesis of silver nanoparticles and evaluation of its antibacterial activity against plant pathogens. *Sci World J* 2014;2014:9.
 9. Vanaja M, Paulkumar K, Rajeshkumar S, Gnanajobitha G, Malarkodi C, Sivakavinesan M, *et al.* Degradation of methylene blue using biologically synthesized silver nanoparticles. *Bioinorg Chem Appl* 2014;2014:8.
 10. Vanaja M, Paulkumar K, Rajeshkumar S, Gnanajobitha G, Malarkodi C, Sivakavinesan M, *et al.* Herbal plant synthesis of antibacterial silver nanoparticles by *Solanum trilobatum* and its characterization. *Int J Metals* 2014;2014:8.
 11. Rajeshkumar S. Synthesis of silver nanoparticles using Fresh bark of *Pongamia pinnata* and its antibacterial action against gram positive and gram negative pathogen. *Resour Efficient Technol* 2016;2:30-5.
 12. Kanagavalli U, Sadiq AM, Sathishkumar, Rajeshkumar S. Plant assisted synthesis of silver nanoparticles using *Boerhaavia diffusa* leaves extract and evolution of antibacterial activity. *Res J Pharm Tech* 2016;9:1064-8.
 13. Asha S, Asha A, Rajeshkumar A. Evaluation of phytochemical constituents and antimicrobial activity of silver nanoparticle synthesized *Ipomoea nil* against selected. *Pathog Asian J Pharm Clin Res Asian J Pharm Clin Res* 2017;10:1-5.
 14. Asha S, Thirunavukkarasu P, Rajeshkumar S. Green synthesis of silver nanoparticles using *Mirabilis jalapa* aqueous extract and their antibacterial activity against respective microorganisms. *Res J Pharm Technol* 2017;10:811-7.
 15. Kumar SV, Karpagambigai S, Rosy PJ, Rajeshkumar S. Phyto-assisted synthesis of silver nanoparticles using *Solanum nigrum* and antibacterial activity against *Salmonella typhi* and *Staphylococcus aureus*. *Mech Mater Sci Eng* 2017;9:1-9.
 16. Rajeshkumar S. Antioxidant activity of characterized silver nanoparticles synthesized using flower extracts of *Chrysanthemum indicum*. *Res J Biotechnol* 2017;12:38-43.
 17. Rajeshkumar S. Phytochemical constituents of fucoidan (*Padina tetrastromatica*) and its assisted silver nanoparticles for enhanced antibacterial activity. *IET Nanobiotechnol* 2017;11:292-9.
 18. Rajeshkumar S, Kannan C, Annadurai G. Synthesis and characterization of antimicrobial silver nanoparticles using marine brown seaweed *Padina tetrastromatica*. *Drug Invent Today* 2012;4:511-3.
 19. Rajeshkumar S, Bharath LV. Mechanism of plant-mediated synthesis of silver nanoparticles a review on biomolecules involved, characterisation and antibacterial activity. *Chem Biol Interact* 2017;273:219-27.
 20. Rajeshkumar S. Green synthesis of different sized antimicrobial silver nanoparticles using different parts of plants a review. *Int J ChemTech Res* 2016;9:197-208.

Source of support: Nil; Conflict of interest: None Declared