International Research Journal of Biological Sciences _____ ISSN 2278-3202
Vol. **8(6),** 28-29, June **(2019)** *Int. Res. J. Biological Sci.*

Short Communication

Green synthesis and antimicrobial activity of the silver nano-particles from crude extract of *Bergenia ciliata*

Rupinderpal Kaur
Lovely Professional University, Phagwara, Punjab, India
ripan151@gmail.com

Available online at: www.isca.in, www.isca.me
Received 7th January 2019, revised 16th May 2019, accepted 9th June 2019

Abstract

Silver nanoparticles (AgNPs) are particular interest because of its strong and wide spectrum of antimicrobial activity which might act as a novel bactericide to solve the serious antibiotic resistance problem. It is because of effectiveness in synthesis of the nanoparticles. This study has been designed for the synthesis of green silver nanoparticles also to study the antimicrobial activity. Methanol extracts of plant leaves was prepared using the maceration and were used for the synthesis of silver naoparticles. Bergenia ciliata silver nano particles found to be more effective against various pathogenic bacterial strain as compared to Bergenia ciliata extracts. The synthesized Bergenia ciliata silver nanoparticles showed increased antimicrobial activity. These results have supported greater advantage of use of bio-green methods for preparation of nanoparticles which have greater potential against antimicrobial activitiy.

Keywords: Green, synthesis, antimicrobial.

Introduction

A natural practice for biosynthesis of silver nanoparticles has been established for exploring area of nano science research development. Silver nanoparticles have accomplished greater attention because of antibacterial properties[1]. In nanoparticles, the surface/bulk ratio of molecules increases that further increase the system's energy, that leads to reduction in the stability of system that further increases the antibacterial activity in comparison to its bulk form. Green nanopartcless can also be even used in biosensor device to detect the bacterial strains[2]. The application of silver nano-particles in medical science also provides an entirely new area for detection of many diseases[3].

By taking into consideration of our efforts we have used a weed *Bergenia ciliata*, for finding its antimicrobial activity.

Bergenia ciliata being an ever green herb[4] found in all the states of India and is used as traditional medicine to cure many types of diseases[5]. *The plant* is also used in India for cure of lung infections and the dissolution of the kidney stones[6]. The plant also possess antitussive activity[7], antiinflammatory as well as diuretic nature[8]. The DNA protection abilitity[5] inhibit the inflammation and to boost the immunity for many microbial infection. The plant contains various phytochemical including paashaanolactone[9], catechin, berginin and gallic acid[10].

Materials and methods

Plant collection, identification and extract preparation: The rhizome of *Bergenia ciliata* were collected from Sirmour (Himachal Pradesh). The shade dried leaves extraction was done with the methanol (i.e. 3:1v/w). Collected extract was then filtered with help of filter paper and then concentrated by the use of rotary evaporator. Then plant extracts was then dried in the oven at 45^0C. After this extract was used for synthesis of nanoparticle and its quantification of antimicrobial activity.

Synthesis of silver-nanoparticles: Silver nano particles synthesis has been done by using $AgNO_3$ in accordance with method given by Zargar et al.[10]. During preparation equal volume of $AgNO_3$ (0.1%) and the plant extract (1%) was mixed 1:1 ratio. The mixture then incubated at the room temperature for about 3 hours. Then the colour change was observed. Then obtained silver nanoparticles (BCAgNPs) were then centrifuged at 6,500 rpm for 4 minute, then washed and dried in the vacuum chamber at 35^0C.

Antibacterial activity: Eight pathogenic bacterial strains including four gram-positive (*Bacillus pumilis* MTCC ACC NO 14884, *Bacillus subtilis* MTCC ACC NO 2757. *Staphylococcus aureus* MTCC ACC NO 96) and four gram-negative (*E.Coli* MTCC ACC NO 3261, *Pseudomnas aeruginosa* MTCC ACC NO 1035, *Shigella dysenterine* MTCC ACC NO 5, *Vibrio cholerae* MTCC ACC NO14033) was used for assay. Bacterial activity determination was done with with help of disc diffusion method given by Ruparelia et al.[11]. Petri plates and nutrient Agar were autoclaved at 121˚C. Then 30ml of growth media was poured to the petriplates. It was allowed to solidify for 15min. Then the 0.5ml of inoculation was spread on the agar plates. Sterile paper discs measured 6mm diameter that absorbed with 20µl of test sample were placed on the solidified

plates under aseptic conditions. Each disc should be pressed down to ensure that there is complete contact with the agar surface. The inoculated plates were made to stand for 1hr and then plates were inverted and placed in an incubator at 37˚±1˚C for 24hr. After 24hr of incubation, each plate was properly examined and the diameter of inhibition zone was measured with help of a scale from inverted side.

Results and discussions

Antibacterial activity of *B. ciliate* leaf extracts has been reported[4]. The highest zone of inhibition in *B. ciliata* AgNPs i.e 21.2mm was observed as compared to *B. ciliata* extract (Table-1). The present study revealed that *B. ciliata* AgNPs was found to possess higher antibacterial activities in comparison to *B. ciliata* extract. The mechanism behind this is the weakening of DNA replication and inactivation proteins[12].

Table-1: Antimicrobial activity of *B. ciliate* (BC) and *B. ciliate* silver nanoparticles (BCAgNPs).

Categories	Bacterial strain	BC Inhibition zone (mm)	BCAgNPs Inhibition zone (mm)	Chloramphenicol Inhibition zone (mm)
Gram-positive	*Bacillus pumilis* MTCC ACC No 14884	10.8	11.7	22.3
	Bacillus subtilis MTCC ACC No 2757	14.0	16.2	28.0
	Staphylococcus aureus MTCC ACC No 96	20.8	21.2	24.8
Gram-negative	*E.Coli* MTCC ACC No 3261	13.9	15.2	28.6
	Pseudomnas aeruginosa MTCC ACC No 1035	8.3	9.7	18.4
	Shigella dysenterine MTCC ACC No 5	14.9	16.3	23.2
	*Vibrio cholera*e MTCC ACC No 14033	11.8	12.7	29.6

Conclusion

From the above results it is concluded that green synthesis of silver nanoparticles of plant extract was carried successfully. Presence of the active phytoconstituents for example phenolic as well as flavonoid have added an extra advantage of the synthesized nanoparticles. Furthermore nano-particles has been evaluated for their antimicrobial activity and were compared with the extract. Significance of study demonstrates broad range of application of using silver nanoparticles.

References

1. Sondi I. and Salopek-Sondi B. (2004). Silver nanoparticles as antimicrobial agent: a case study on E. coli as a model for Gram-negative bacteria. *J. Colloid Interface Sci.*, 275, 177-182.
2. Xia D., Luob X., Ninga Q., Lud Q., Yaod K. and Liud Z. (2007). The detection of HBV DNA with gold nanoparticle gene probes. *J. Nanjing Med. Univ*, 21, 207-212.
3. Bhumkar D.R., Joshi H.M., Sastry M. and Pokharkar V.B. (2007). Chitosan reduced gold nanoparticles as novel carriers for transmucosal delivery of insulin.*Pharmaceutical research*, 24(8), 1415-1426.
4. Mazhar-Ul-Islam I.A., Mazhar F., Usmanghani K. and Gill M.A. (2002). Evaluation of antibacterial activity of Bergenia ciliata. *Pakistan Journal of Pharmaceutical Sciences*, 15(2), 21-27.
5. Rajkumar V., Guha G., Kumar R.A. and Mathew L. (2010). Evaluation of antioxidant activities of Bergenia ciliata rhizome. *Rec. Nat. Prod.*, 4(1), 38-48.
6. Saha S. and Verma R.J. (2013). Inhibition of calcium oxalate crystallization in vitro by an extract of Bergenia ciliate. *Arab. J. Urol.*, 11(2), 187-192.
7. Sinha S., Murugesan T., Pal M. and Saha B.P. (2001). Evaluation of anti-tussive activity of Bergenia ciliata Sternb. rhizome extract in mice. *Phytomedicine*, 8(4), 298-301.
8. Gehlot D. and Bohra A. (2000). Antibacterial effect of some leaf extracts on Salmonella typhi. *Indian J. Med. Sci.*, 54(3), 102-105.
9. Dhalwal K., Shinde V.M., Biradar Y.S. and Mahadik K.R. (2008). Simultaneous quantification of bergenin, catechin, and gallic acid from Bergenia ciliata and Bergenia ligulata by using thin layer chromatography. *J. Food Comp. Anal.*, 21(6), 496-500.
10. Zargar M., Hamid A.A., Bakar F.A., Shamsudin M.N., Shameli K., Jahanshiri F. and Farahani F. (2011). Green synthesis and antibacterial effect of silver nanoparticles using Vitex negundo L. *Molecules*, 16(8), 6667-6676.
11. Ruparelia J.P., Chatterjee A.K., Duttagupta S.P. and Mukherji S. (2008). Strain specificity in antimicrobial activity of silver and copper nanoparticles. *Acta Biomater.*, 4(3), 707-716.
12. Feng Q.L., Wu J., Chen G.O., Cui F.Z., Kim T.N. and Kim J.O. (2000). A mechanistic study of the antibacterial effect of silver ions on Escherichia coli and Staphylococcus aureus. *J. Biomed. Mater. Res.*, 52(4), 662-668.