



Green Synthesis of Silver Nanoparticles by *Boucerosia procumbens* (Gravelly & Mayur.)

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Abstract

The aim of this study was to synthesis of Silver Nanoparticles in the ethanol extract of *Boucerosia procumbens*. Nanoparticles are being used in many commercial applications. The synthesized Silver Nanoparticles were characterized by SEM (Scanning Electron Microscopy). It was found that ethanol silver iron can be reduced by ethanol plant extracts of plant to generate to extremely stable Silver Nanoparticles.

Keywords: *Boucerosia procumbens*; SEM (Scanning Electron Microscopy); AgNPs; Ethanol Silver Nanoparticles.

Introduction

The field of nanotechnology is one of the most active researches nowadays in modern material science and technology. Nanoparticles are fundamental building blocks of nanobiotechnology. The most important and distinct property of Nanoparticles is they exhibit larger surface area to volume ratio (Leela *et al.*, 2008). "Nano" is a Greek world synonymous to dwarf meaning extremely small. Nanotechnology is one of the areas of frontiers research. It has wide applications in science and technology for developing new material. Use of Nanoparticles is gaining attention in the present century as the process well defined chemical, optical and mechanical properties. (Sivkumar *et al.*, 2011).

Recently, great efforts were made to use green and environmentally friendly methods for the synthesis of nano size materials. These efforts involve the use of plant or fruit extracts as surfactants plant parts such as, leaf, root, latex, and stem are being used for metal Nanoparticles synthesis (Yang *et al.*, 2010; Bai *et al.*, 2010; Sohn and Cohen, 1997). The use of plant materials for the synthesis of Nanoparticles

could be more advantages, as it does not require elaborate process such as intracellular synthesis and multiple purification steps or the maintenance of microbial cell cutlers. Silver Nanoparticles containing material are used in medicine to reduce infection in burn treatment.

Boucerosia include succulent plants with leaf less erect, trailing or decumbent stems, with ephemeral vestigial leaves. This genus is different from the genus *Caralluma* mainly due to the presence of umbellate terminal cymes. Rmesh *et al.*, (1999) reported the anti-inflammatory activity of genus *Boucerosia* species in India (Karuppusamy, 2011). Among the them endemic *B. procumbens* is a critically endangered species (Nayar, 2002). (IUCN, 2015) and found in Maruthuvamalai and Aramboli rocky hills in Kanyakumari district in Tamil Nadu. (RET), (David samuel *et al.*, 2008). It has long trailing stems, sometimes exceeding up to (Dutta AC. 1994). It has no prominent leaf scars on the stem and the edges of the stems were sharp with square angles. The species grows mainly near Seasonal streamlets in rocky crevices on the dry hills (Zakaria M.N.M *et al* 2001) locally *B. procumbens* is known as

“Paaraikalli”. Since it grows in the rocky substratum and looks like cactus. Traditionally the species is used for bowel complaints and also medicated oil prepared from the plant was used for rheumatism and to relieve pain. So, far there was no report on Silver Nanoparticles activity of this species. In the present study synthesis of silver nanoparticles of the species is studied.

Materials and Methods

Boucerosia procumbens, selected for this study was collected from Marunthuval malai hills lying at latitude 8.9° N and longitude 77 33° E of Kanayakumari District of Tamilnadu state in India. The plant material was thoroughly washed with running tap water and washed with sterile distilled water, followed by drying in room temperature. Then it was grounded in to powder and stored in air tight sterile containers.

Preparation of Crude Extract

5gram, powder material of plant *Boucerosia procumbens* was taken in a sterile conical flask. 50ml of distilled water was added to it. Then the mixer was kept in incubator for 48hours at room temperature. After incubation, the solution is subjected to centrifuge at 6000rpm for 10 minutes to obtain the pellet. Then the Supernatant was collected from the tube and it was kept for evaporation (to sediment the particles) until it get fully evaporated.

Synthesis of Silver Nanoparticles

After effective evaporation, the settled powder was collected. Then that powder was taken as 25mg, 50mg, 75mg, and 100mg concentration and mixed with 44ml of Triple Distilled Water is taken in four sterile conical flasks. 1mM Silver nitrate solution is taken and introduced into the each conical flask and mixed well. The conical flask containing silver nitrate solution is kept in Magnetic stirrer. Then the 6ml of various concentrated sample solution is taken and made to add drop by drop into the silver nitrate solution. This process continues until the colour of the solution changes from green to brown. Then they obtained solution is kept for evaporation at room temperature or in incubator. After evaporation the product will be obtained as powder. Then the powder is washed twice with distilled water. Then they obtained solution is used for the further processes.

Chemical Preparation of Silver Nanoparticles

100 ml 1mM silver nitrate is taken and it is heated at boiling temperature using hot plate with magnetic stirrer. After attaining boiling temperature 10ml of tri sodium citrate added drop by drop until it attains pale yellowish colour. Then they obtained solution is kept for evaporation at room

temperature or in incubator. After evaporation the product will be obtained as powder. Then the powder is washed twice with distilled water. Then they obtained solution is used for the further processes.

SEM Analysis

SEM analysis each of the colloidal solution containing AgNPs were centrifuged at 4,000 rpm for 15 min, and the pellets was discarded and the supernatants were again centrifuged at 25,900 rpm for 30 min. This time, the supernatants were discarded and the final pellets were dissolved in 0.1 mL of deionized water. The pellet was mixed properly and carefully placed on a glass cover slip followed by air-drying. The cover slip itself was used during scanning electron microscopy (SEM) analysis. The samples were then gold coated using a coater (JEOL, Akishima - shi, Japan, and Model No JFC-1600). The images of NPs were obtained in a scanning electron microscope (ZEISSEVO-MA 10, Oberkochen, Germany). The details regarding applied voltage, magnification used and size of the contents of the images were implanted on the images itself.

Result and Discussions

The Ethanolic extract of *B. procumbens* was used to produce silver nanoparticles and the reduction of silver ions into silver particles during exposure to the plant extract is followed by colour change (Fig. 1). It is well known that silver nanoparticles exhibit yellowish brown colour in aqueous solution due to excitation of surface plasma vibrations in silver nanoparticles (Shankar *et al.*, 2004). As the ethanolic extract of *B. procumbens* was mixed in the aqueous solution of silver ion complex, it started to change the colour from green to yellowish brown due to reduction of silver ion, which may be the indication of formation of silver nanoparticles shows agreement with previous reports (Shankar *et al.*, 2004; Kaviya *et al.*, 2011). Almost all the herbal mediated silver nano solution safer incubation time were showed the colour change from light to dark colour.

Conclusion

The study included the synthesis of the silver nano particles from the plant of *Boucerosia procumbens*. The plant extract is capable for the synthesis of Nanoparticles of silver by green method. The synthesized Nanoparticles were analyzed by SEM method. The synthesized silver nano particles may exhibit significant biological activity. Thus it can be conclude that *Boucerosia procumbens* possess more activity against further studies would reveal its other activities.

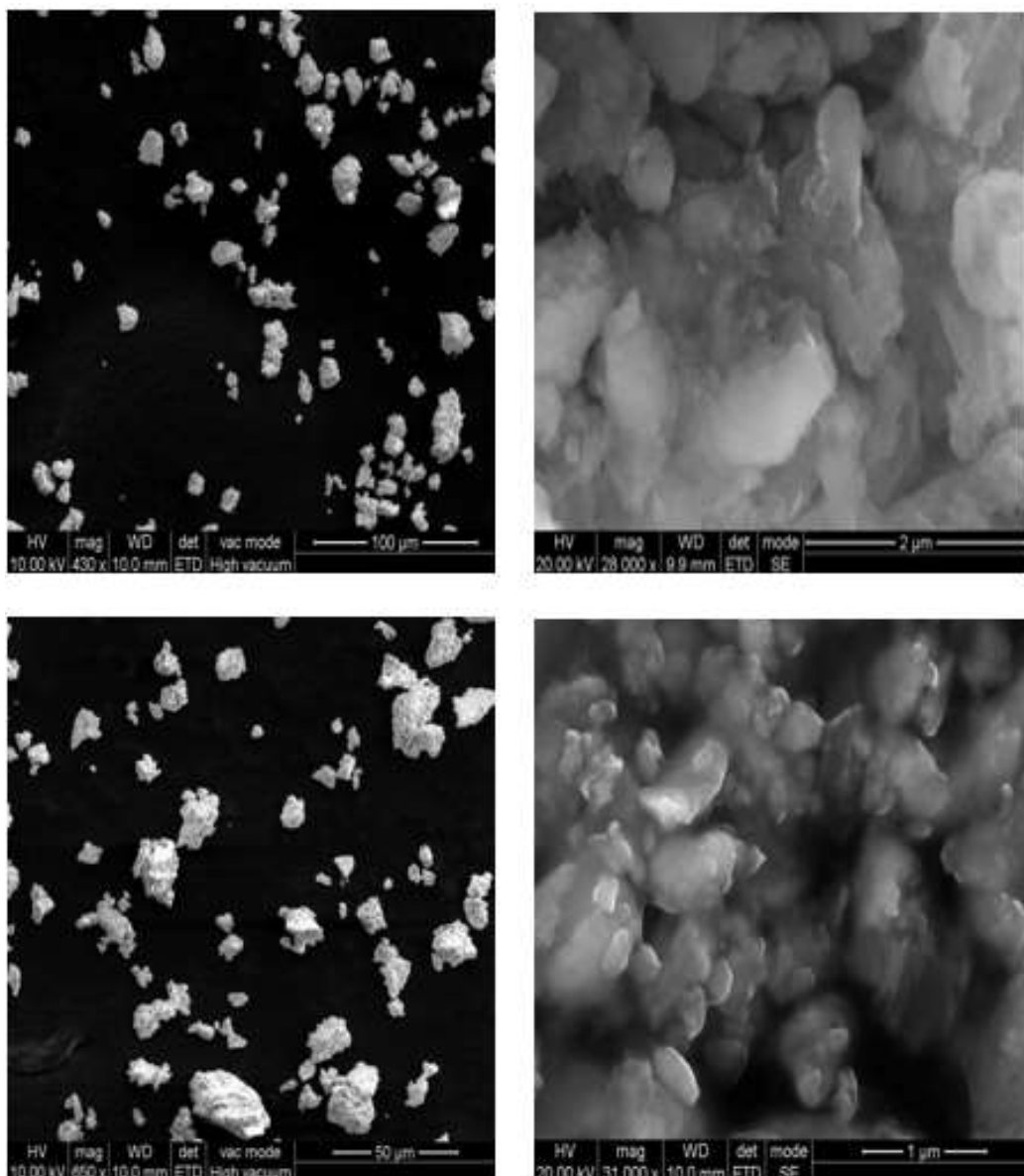


Fig 1: SEM Analysis of silver Nanoparticles

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References

- Bai H and Liu X (2010) Green hydrothermal synthesis and photoluminescence property of ZnO₂ nanoparticles. . *Mater. Lett.* 64: 341. DOI: [10.1016/j.matlet.2009.11.008](https://doi.org/10.1016/j.matlet.2009.11.008)
- DasR, Nath S S Chakdar D, Gope G and Bhattacharjee R (2009) *Journal of nanobiotechnology Online.* vol.5.
- David Samuel P, Nair PKK and Prakash Kumar R (2008) Endemic Plant of Marundivalmalai hills of Southern Western Ghats Kanyakumari District- *India J. of Basic Applies Biology:* 39-46.
- Dutta AC (1994) Botany for degree students. London: Oxford University Press; p. 73
- Karuppusamy S (2011) Notes on the Stapeliad genus *Boucerosia* (Asclepiadaceae) of South Peninsular India. *Aloe* 48: 18-22.
- Kaviya S, Santhanalakshmi J and Viswanathan B (2011) Green synthesis of silver nanoparticles using *Polyalthia longifolia* leaf extract along with D-sorbitol: study of antibacterial activity. *Journal of nanotechnology* 2011.
- Leela A and Vivekanandan M (2008) Tapping the unexploited plant resources for the synthesis of silver nanoparticles. *African Journal of Biotechnology* 7(17): 3162-3165.
- Nayar MP (2002) Hot spots of endemic plants of India, Nepal and Bhutan Tropical Botanical Garden Research Institute, Trivandram. India *Plants* 3: 227- 232.
- Ramesh M, Rao YN, Kumar MR, Rao AVNA, Prabhakar MC and Reddy BM (1999) Antinociceptive and anti-inflammatory activity of carumbelloside-1 isolated from *Caralluma*

- umbellate*. *J Ethnopharmacol* **68**: 349-352. DOI: [10.1016/S0378-8741\(99\)00122-1](https://doi.org/10.1016/S0378-8741(99)00122-1)
- Shankar SS, Rai A, Ankamwar B, Singh A, Ahmad A and Sastry M. (2004) Biological synthesis of triangular gold nanoprisms. *Nature materials* **3**(7): 482-488. DOI: [10.1038/nmat1152](https://doi.org/10.1038/nmat1152)
- Sivkumar J, Premkumar C, Sonthanam P and Saraswati N (2011) Preparation of Silver Nanoparticles using *Calotropis gigantea* Leaf. *African Journal of Basic and Applied Science* **3**(6): 265-270
- Sohn BH and Cohen RE (1997) Processible optically transparent block copolymer films containing superparamagnetic iron oxide nanoclusters. *Chemistry of materials* **9**(1): 264-269. DOI: [10.1021/cm960339d](https://doi.org/10.1021/cm960339d)
- The IUCN RED (2015) list of Threatened Species. Retrieved from www.iucnredlist.org.
- Yang LY, Feng GP and Wang TX (2010) Green synthesis of ZnO nanoparticles from hydrozincite and hydrogen peroxide at room temperature. *Mater Lett* **64**: 1647. DOI: [10.1016/j.matlet.2010.04.022](https://doi.org/10.1016/j.matlet.2010.04.022)
- Zakaria MNM, Islam MW, Radhakrishnan R, Chen HB, Kamil M, Al-Gifri AN, Chan K, Al-Attas A (2001) Antinociceptive and anti-inflammatory properties of *Caralluma arabica*. *J Ethnopharmacol* **76**: 155-158. DOI: [10.1016/S0378-8741\(01\)00208-2](https://doi.org/10.1016/S0378-8741(01)00208-2)