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STUDY OF STABILITY OF GREEN SYNTHESIZED SILVER NANOPARTICLES FROM *LINCUS LINIFOLIA* IN AQUEOUS MEDIA

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Abstract: Silver nanoparticles are synthesized from leaves extract of traditional medicinal plant *lincus linifolia*, used locally in influenza, cough, skin diseases, malaria, worm, sinus sitites etc for healing, by green synthesis method in aqueous media and formation of Ag Nano particles are confirmed by UV-Vis spectroscopy, EDX and SEM. Though no external polymeric external capping agents are used ,the existence of Ag nano particles range 60-90nm in aqueous media after two months later from synthesizing period strongly agree bio-organic compounds present in the sample plays a role for stabilization of nano particles.

Keywords: Medicinal Plants, Green synthesis, Nanoparticle, Aqueous media, Stability

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INTRODUCTION

In north east India, there are a large of traditional medicinal plants used in the treatment of cut and injuries, blood pressure, skin diseases , dysentery, blood deficiency , jaundice, urinary trouble , cough, asthma , influenza, malaria etc.[1].These plants are as source of bio-reductant and stabilizers and reported to contain alkaloids, glycosides, tannins, saponnins and aromatic compounds [2,3]. Silver nano particles are used as anti-bacterial and as catalytic agents and also as optical sensor. By using plant extract methods, a lot of groups are involved to synthesis silver nanoparticles from plants like Aloe Vera[4], Clove (Syzygium Aromaticum), Onion (Allium Cepa)[5] , Geranium leaf[6], Rose leaf, neem[7], Tulasi(Ocimum sanctum[8], Brahmi [9]etc.

Due to small sizes regime, nanoparticles are highly active centers but not thermodynamically stable due to their high surface energies and large surface. For stability of these particles, external agents like organic ligands, inorganic capping materials, metal salts, colloids or soluble polymers are added in the sample [10, 11, 12].But due to awareness about sustainable development technologies as well as environmental safety measure, different green synthesis methods are adopted for generation of nanoparticles.Mainly no external capping agents are used for stabilization of nanoparticles in green synthesis methods and from various reports it is found that bio-organic compounds present in the sample mainly takes plays a role for stability [13,14].

MATERIALS AND EXPERIMENTAL METHODS

To synthesis silver nano particles by plant extract biosynthesis method and study its characterization, Lincus linifolia (Assamese vernacular name-Dooron Bon) traditional medicinal plant is selected which is used locally in influenga, cough, skin diseases, malaria, worm, sinus sitites etc for healing.

All leaves of this plant are collected some villages near Dibrugarh University campus. After collecting, 20gm of fresh leaves from different plants are washed with tap and de-ionised water and finely cut. These cut leaves are placed in a 300ml Erlenmeyer flask with 100ml of sterile de-ionised water and boil the mixture for 5 minute and filtered through whatmann no 42 filtre paper. Plant extract 5ml are added into 100ml aqueous solution of 1mM silver nitrate in conical flask of 250ml content at room temperature. The solution is shaked and boil at some certain temperatures ranges 30°C by hot plate magnetic stirrer for 24h at 150rpm (REMI-1MLH). Again, the solution is shaked in a high speed centrifuge at 18,000rpm for 5 min (REMI-R-24). The colour change in reaction mixture (metal ion solution + plant extract) is record through visual observation. Yellowish black colour appearance indicates formation of silver nanoparticle.This colour changes due to surface plasmon resonance of silver nano particles.

A B C

Fig-1 Lincus linifolia (*Assamese vernacular name -Dooron Bon)*

In the Fig-1 (A) represents colour of silver nitrate solution, (B) represents colour of leaves extract, (C) represents colour of formation of silver nano particles in leaves extract

RESULT AND DISCUSSIONS

UV-VIS Spectra analysis

Surface plasmon resonance (SPR), one of the optical properties exhibited by metallic nano-particles. Free electrons in metal oscillate co-operatively from their equilibrium position where the positive charges of metal (atomic nucleus) bind the ensemble of the free electron. This plasma oscillation localizes at the surface or interface. When the wave vector of the incident light matches the wavelength of the surface plasmon, the electron resonate which is called as SPR. The coupling of the incident light to the surface plasmon results in a loss of energy and for this, a reduction in the intensity of the light .A dip occurs. With the help of Gaustav Mie theoretical work on electrodynamics, Plasmon resonance depends explicitly on the particle size [15,16]. Both absorption wavelength and peak width increases as the particle size increase. These resonances are recorded by uv-vis spectrometer (Shimadzu uv-vis spectometer-1700 series) and spectra's are shown in fig-2 and Sharp peak at 453nm(absorbance-0.443) is observed. From various literature, formation of silver nano-particles are detected by uv-vis spectrometer at different nm(Range-340-620nm).For morphology study of nano-particles, UV-VIS Spectroscopy can be used and comparing other reports[17,18], size of silver nano particles in this case are within the range of 10-70nm, some particles greater than 80nm.

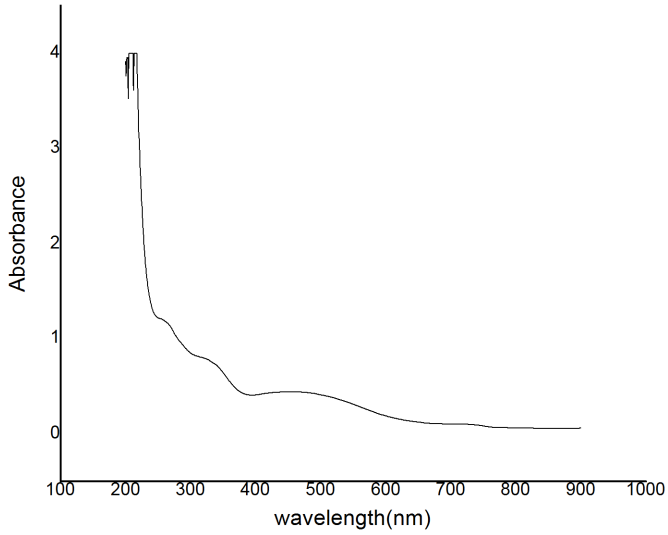

Fig-2. UV-VIS spectra of Lincus linifolia (*Assamese vernacular name-Dhoran Bon*)

EDX spectra Analysis

Energy dispersive X-ray spectrometer is an extremely powerful technique for qualitative and quantative survey for analysis elements present in the sample and it is based on photon nature of light. The vertical axis is the number of X-ray counts i.e. the number of photons per energy interval and the horizontal axis is the energy scale in KeV. EDX spectra of this plant leaves extract solution is recorded by JEOL Model JED – 2300 after 8-weeks later from synthesizing period. The x-ray identification (elements and origin of lines) are indicated top of the peaks.

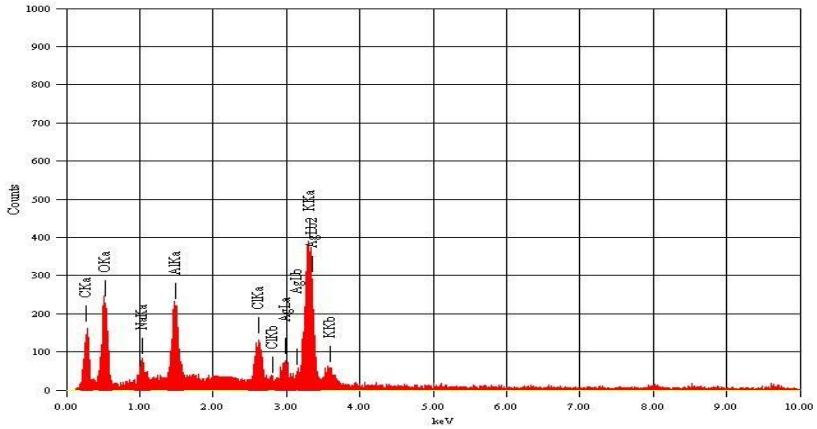

Fig-3.EDX spectra of Lincus linifolia (*Assamese vernacular name-Dhoran Bon*)

Formation of metallic nano particles in a solution strongly confirmed by EDX spectras.For Silver nano-particles absorption peaks should be situated within 3 to 4 KeV range. From this

spectrum, peaks of silver nano-particles are observed which directly confirmed formation of silver nano-particles.

SEM images Analysis

Scanning Electron microscopic (SEM) images, recorded by JEOL Model JSM-6390LV, in Fig-4 of samples of the *Lincus linifolia* plant confirmed formation of Ag nano particles. Relatively spherical nanoparticles are seen range within 60-90nm. This image is taken two months later after synthesizing silver nanoparticles in the absence of external polymeric capping agent which directly indicates stabilization of these particles by bio-organic capping agents present in the solution. Though a large potion agglomerated but present of silver nanoparticles gives a good result about stability in aqueous medium during this long period. Using image processing software (Image-J) sharp edges of agglomerated portion are shown in fig-5.

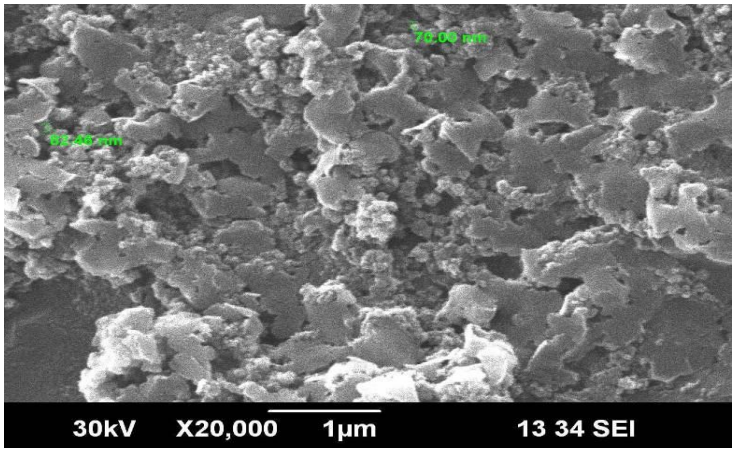

Fig-4.SEM image of silver nanoparticles and its agglomerate portion

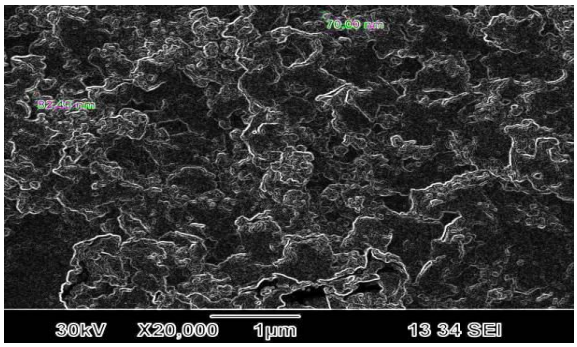

Fig-5.Sharp Edges of agglomerate portion

CONCLUSIONS

Leaf extract of traditional medicinal plants are suitable for synthesized silver nano-particles in aqueous solution by green synthesis method which are low cost-effective and eco-friendly. From the study, it is revealed that reduction of silver ions occur due to the presence of water soluble organic compounds in the leaves of plants and these bio-organic compounds are act as capping agents for stabilization of silver nano particles.

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REFERENCE

1. Sikmon J. E., Morales M. R. , Phippe W. B., Vieira R. F., Janick J. (Ed.). Z. H.). ASHS press, Alexandria, VA 495 (**1990**).

2. Mallikarjuna,Narasimha G., Dillip G.R., Praveen B., Shreedhar B., Sree Lakshmi C., Reddy B V S, Deva B.,

3. Prasad R., *Digest Journal of Nanomaterials and Biostructures* Vol. 6, No 1, January-March **2011**, p. 181 - 186

4. Mano Priya K., Karunai Salvia B.,John Paul J, *Digest Journal of Nanomaterials and Biostructures* Vol. 6, No 2,April - June **2011**, p. 869 – 877

5. Handra S. P., Chaudhary M., Pasricha R., Ahmad A., Sastry M., *Biotechnol. Prog*. 22, 577 (**2006**).

6. Axena A, Tripathi R.M., Singh R. P.,*Digest Journal of Nanomaterials and Biostructures* Vol. 5, No 2, April- June **2010**, p. 427 – 432

7. Shankar S. S., Ahmad A., Sastry M. *Biotchnol. Prog*. 19, 1627 (**2003**).

8. Shankar S. S., Rai A. , Ahmad A., Sastry M. *J. Colloid. Interf. Sci.* 275, 496 (**2004**)

9. Mallikarjuna K., Narasimaha G., Dillip G. R.,Praveen B., Shreedhar B., Sree Lakshmi C., Reddy B. V. S, Raju B. D. P. *Digest Journal of Nanomaterials and Biostructures* Vol. 6, No 1, January-March **2011**, p. 181 - 186

10. Mahitha B., Raju B. D, Dillip G.R., Reddy C. M, Mallikarjuna K., Manoj L., Priyanka S., Rao K. J, Sushma

11. N.J,*Digest Journal of Nanomaterials and Biostructures* Vol. 6, No1, January-March **2011**, p. 135-142

12. G. A. Ozin, A. C. Arsenault, L. Cademartiri, *Nanochemistry: A ChemicalApproach to Nanomaterials*, Royal Society of Chemistry, Cambridge, UK,2000.

13. G. Schmid, V. Maihack, F. Lantermann and S. Peschel, *Ligandstabilizedmetal clusters and colloids: properties and applications,* J. Chem.Soc. Dalton Trans., 1996, 589–595

14. R Luque,R S Verma ed.,sustainable Preparation of metal Nanoparticles;Methods and Applications;RSC publishing,p1-6,2013

15. Gogoi SJ, Gogoi B, Green Synthesis of Nano Particles from Leaves of Ethno Medicinal Plants - A New Approach, Research Journal of Pharmaceutical, Biological and Chemical Sciences, Volume 4 Issue 3, 2013,p-862-869

16. S. J. Gogoi,Green synthesis of silver nanoparticles from leaves extract of ethnomedicinalplants- *Pogostemon benghalensis (B) O.Ktz.,* Advances in Applied Science Research, 2013, 4(4):274-278

17. Mie G, Am.Phys.25, 377, 1908

18. G Cao,Nanostructures & nanomaterials-Synthesis,Properties & Applications;Imperial College Press,2004,p-362-367

19. Li, W. R.; Xie, X. B.; Shi, Q. S.;, Zeng, H. Y.;, Ou-Yang, Y. S.; Chen, Y. B. *Appl Microbiol Biotechnol*. 2010,85(4), 1115-22

20. Lubick, N. *Environ. Sci. Technol*., 2008, 42 (23), p 8617