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EXTRACELLULAR SYNTHESIS OF COPPER NANOPARTICLES USING DIFFERENT PLANT EXTRACT

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ABSTRACT

Present approach for synthesizing copper nanoparticles using plant extract is important plant based bio-resource which eliminates the use of synthetic reducing and capping agents. These biocompatible nanoparticles were nontoxic. The plant extracts of *Azadiracta indica, Lantana camera, Calotropis procera and Tridax procumbens* was successfully used for Synthesis of copper nanoparticles. The synthesized copper nanoparticles from plant extracts showed the signatory colour then optical absorbance was recorded by UV Visible spectrophotometer in 24 and 48 hrs. It clearly showed that the *Lantana camera* expressed the highest absorbance value compared to other three plants and demonstrated that the smaller particle sizes of synthesized copper nanoparticles and *Lantana camera* and *Tridax procumbens* showed maximum zone of inhibition having diameter 10mm while the neem showed the 5mm and the *Calotropis procera* shows the 6mm zone against *E.coli*.

KEYWORDS: Copper Nanomaterial, Zone of Inhibition, Spectral Analysis, Medicinal Plant, UV-Vis Analysis

INTRODUCTION

Nanoparticles are attracting increasing attention on account of their potential applications and unique properties, which are strongly influenced by their size, morphology and structure. In recent years, much attention has been paid to metal oxide nanoparticles that give rise to unique electronic and optical properties that are useful for a variety of new technologies in optoelectronic devices, chemical sensors, molecular catalysts and magnetic materials. Metal oxide nanoparticles (NPs) have shown great potential in the field of sensing, optoelectronics, catalysis, solar cells and so on, due to their physical and chemical properties different from those in the bulk material. Among all the metal oxides, copper oxide nanomaterials have attracted more attention due to their unique properties. In recent years, there is a growing interest to synthesize Cu nanostructures not only for the development of synthetic strategies, but also for the examination of their sensing, catalytic, electrical and surface properties. Green chemistry is the design, development and implementation of chemical products and processes to reduce or eliminate the use and generation of substances hazardous to human health (Gopalkrishnan *et al.,* 2012).

METHODOLOGY

Collection of Plant Samples

The taxonomically authetinicated healthy leaves were collected early in the morning OF ***Tridax procumbens, Azadiracta indica, Lantana camera, Calotropis procera.***

Preparation of Plant Extract

About 20g of freshly, taxonomically authenticated healthy leaves of *Tridax procumbens, Azadiracta indica, Lantana camera, Calotropis procera* were collected, washed thoroughly with double distilled water, cut into fine pieces and boiled with100mL double distilled water in Erlenmeyer flask for 8-10 min. The extract was cooled to room temperature and filtered through Whatman filter paper

Preparation of Cu Nan Oparticles

In a typical experiment, 10mL of the *Tridax procumbens* leaf extract was added to 10 ml of a Fehling's solution. After 10 minutes, the colour of the solution changed from blue to brick red, indicating the formation of cuprous oxide nanoparticles.

UV-Vis Spectral Analysis

The colour of solution is blue indicated that presence of copper nanoparticles in given extract. Then the optical absorbance was recorded by UV Visible Spectrophotometer over a wavelength range 200-700 nm and optical absorbance recorded within 24hrs and after 24 hrs as shown in Table 1 and Table 2.

Table 1: Optical Absorbance Recorded Within 24hrs

Plant Samples	UV Range(Readings)			
	At 240nm	At 280nm	At 420nm	At460nm
Lantana camera	0.164	0.164	0.108	0.089
Tridax procumbens	0.082	0.075	0.006	0.007
Azadiracta indica	0.080	0.077	0.033	0.014
Calotropis procera	0.080	0.080	0.064	0.059

Table 2: Readings Are After 24 Hrs

Plant Samples	UV Range(Readings)			
	At240nm	At280nm	At 420nm	At 460nm
Lantana camera	0.303	0.304	0.121	0.091
Tridax procumbens	0.240	0.237	0.072	0.043
Azadiracta indica	0.241	0.235	0.102	0.072
Calotropis procera	0.241	0.237	0.211	0.206

Antibacterial Activity of Copper Nan Oparticles against *E. coli*

E. coli was used as reference strains for Gram- negative. Strains were grown on nutrient Agar

And activity was checked by Agar well diffusion method as shown in Plate 1 and Plate 2.

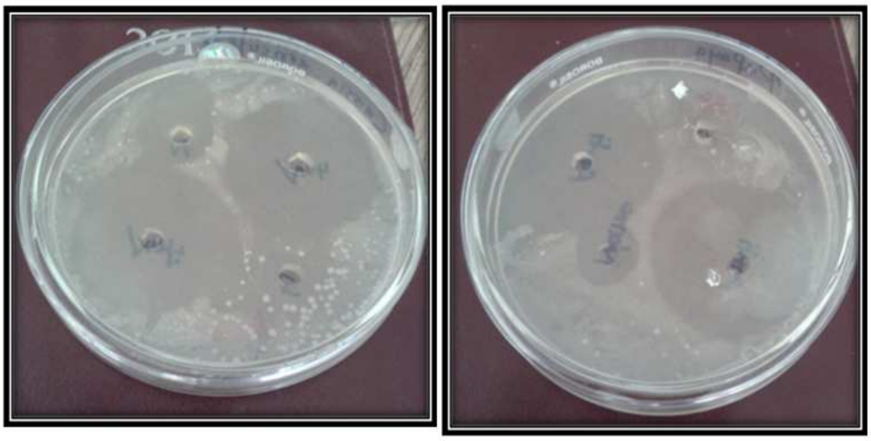

Plate 1: The ZOI Shows *Azadiracta Indica* and *Lantana Camera Against E.Coli*

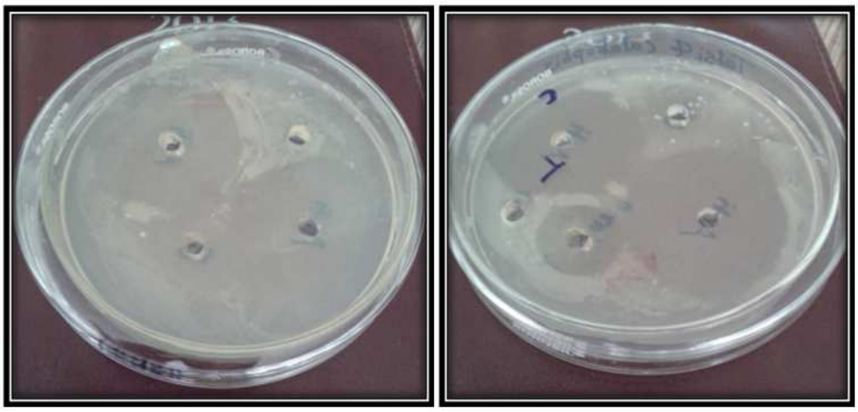

Plate 2: The ZOI Shows *Calotropis Procera* and *Tridax Procumbens against E. coli*

Antifungal Activity of Copper Nan Oparticles against *Aspergillus Niger*

A.niger was used as reference strain was grown on Potato Dextrose Agar and Efficiency of plant extracts against *A.niger was observed* under laboratory conditions by Agar well diffusion method as shown in plate no. 3 and for *Calotropis procera*, *Azadiracta indica* there was no Zone of Inhibition was observed.

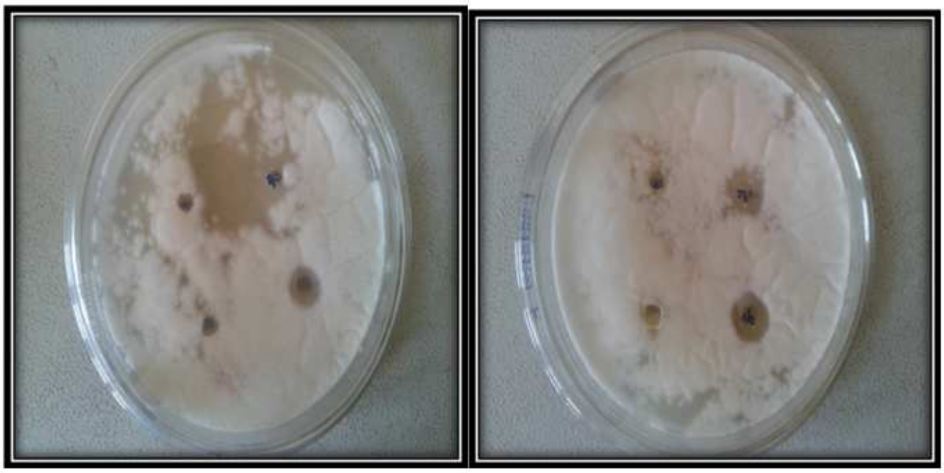

Plate 3: ZOI Shows *Tridax Procumbens* and *Lantana Camera against A. Niger*

DISCUSSIONS

The results showed that copper nanoparticles can be isolate from the four plants *Lantana camera,Calotropis procera,Azadiracta indica, Tridax procumbens.* The *Lantana camera* have maximum absorbance in UV visible Spectrophotometer. These copper nanoparticles isolated from the plants show the antibacterial and antifungal activity but, the copper nanoparticles are most effective against bacteria than fungi.In this present work copper nanoparticles displayed the antibacterial activity against *E.coli* respectively in which *Lantana camera* and *Tridax procumbens* showed the highest sensitivity compared to the other two plants. The maximum zone of inhibition having diameter 10mm showed the plant *Tridax procumbens* and *Lantana camera* while the neem showed the 5mm and the *Calotropis procera* shows the 6mm zone against *E.coli*.

D.R.Mujumdar (2012) also carried the same work on *Lantana camera* and its antifungal activity against *E.coli*. In their study, leaf extract of the weed *Lantana camera* was screened for extracting copper from integrated circuits and obtaining it in nano form. Hence, this work gave a solution to bioremediation as well as the recovery of valuable metal nanoparticles. The Synthesized copper nanoparticles were tested for antimicrobial activity against pathogenic bacterium *E.coli* 2065 by agar disc-diffusion method and *Lantana camera* showed the 0.2cm zone. Similarly In this project similar results were seen and also observed the 10 mm zone against *E.coli*. K.Gopalkrishnan *et al.*,(2012) carried out the antibacterial activity of copper oxide nanoparticles on *E.coli* synthesized from *Tridax procumbens*. They also checked the optical absorbance at 260nm and in UV visible spectrum the peak at 260nm is due to inter band transition of core electrons of copper and copper oxide and performed antibacterial tests against the Gram negative bacterium *E.coli* on LB agar plates contaning different concentrations of copper nanoparticles and these copper nanoparticles inhibited bacterial growth by 65%. Similarly at 240nm the optial absorbance within 24hrs and after 24hrs get increased and showed the highest peak point and these copper nanoparticles tested against the gram negative bacteria *E.coli* and showed the ZOI 10mm. Harne *et al*., (2012) worked the copper nanoparticles synthesized from *Calotropis procera* aqueous extrct showed the excellent biocompatibility therefore the copper nanoparticles which were synthesized from latex of *Calotropis procera* also effective against the *E.coli* . Padil (2013) worked on green synthesis of copper oxide nanoparticles using gum karaya as biotemplate and their antibacterial applications in which CuO nanoparticles synthesized using gum karaya and tested against the Gram-negative and Gram-positive bacteria *E.coli* and *S.aures* and it shows ZOI 16.2±0.8 and 14.5±0.6mm. Similarly the *Azadiracta indica* also act against bacteria so copper nanoparticles synthesized from *Azadiracta indica* displayed the best results against *E.coli* and showed 5mm ZOI. The copper nanoparticles are most effective against bacteria than fungi so copper nanoparicles showed minium ZOI against *A.niger* compared to *E.coli. Recently* Moloto *et al.,* have demonstrated that with an increase in precursor concentration, there was increase in partcle size. The nature of biomolecules involved in the reduction and formataion of copper nanoparticles.

CONCLUSIONS

The present green method for synthesis of copper nanoparticles is simple, mild and Ecofriendly. The formed copper nanoparticles are highly stable and have antibacterial and antifungal action on bacteria and fungus. The synthesized copper nanoparticles from plant extracts showed the signatory colour then optical absorbance was recorded by UV Visible spectrophotometer in 24 and 48 hrs. It clearly showed that the *Lantana camera* expressed the highest absorbance value compared to other three plants. The antimicrobial activity performed on *E.coli* and *A.niger* clearly demonstrated that the smaller particle sizes of synthesized copper nanoparticles from *Lantana camera* and *Tridax procumbens* have higher antibacterial effects and higher ZOI compared to fungi. The antibacterial activity of synthesized copper nanoparticles using natural source is a promising contender for various applications in wound dressing, bed lining, as well as for medicinal and food applications and against pathogens. The green synthesis of copper nanoparticles holds an excellent biocompatibility.

REFERENCES

1. Gopalkrishnan. K, Ramesh. C, Raghunathan. V (2012). Antibacterial activity of Cu_2O nanoparticles on *E.coli* synthesized from *Tridax procumbens* leaf extract and surface coating with polyaniline. ***Digest J. Nanomaterials and Biostructures*** **Vol.7, No.2, April-June 2012 p.833-839.**

2. Harne. S, Sharma. A, Dhaygude. M, Joglekar. S, Kodam. K. K, Hudlikar. M (2012). Novel route for rapid biosynthesis of copper nanoparticles using aqueous extract of *Calotropis procera* L. latex and their cytotoxicity on tumor cells. ***Colloids and Surfaces B: Biointerfaces*** **95(2012)284-288.**

3. Mujumdar D.R. (2012). A single-step eco-friendly approach has been employed to synthesize copper nanoparticles. ***International J. Eng Sci and Technology (IJEST)*** **Vol. 4 No-10 October 2012.**

4. Padil V. V. T, Cernik. M (2013). Green synthesis of copper oxide nanoparticles using gum karaya as a biotemplate and their antibacterial application. ***International J. nanomedicine*** **2013:889-898.**