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E: ISSN NO.: 2455-0817 *Remarking An Analisation*

Synthesis of Copper Nanoparticles as Antimicrobials

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Abstract

Accelerated emergence of antimicrobial resistant strains to conventional antimicrobial agents has complicated the treatment against harmful microbes. In view of ineffective antimicrobial agents, there is need to seek new alternative and safer antimicrobial agents. With the exploration of biomedical nanoparticles as antimicrobial agents, nanoparticles can be used effectively against various microbes. The antimicrobial actions of nanoparticles include cidal destruction of cell membranes, blockage of enzyme pathways, alterations of microbial cell wall, and nucleic materials pathway. In this study, the Copper nanoparticles were synthesized using plant extracts of *Saraca asoca* and *Tridax procumbens*. Nanoparticles thus obtained were used as antimicrobials against three bacterial species - *Pseudomonas putida*, *Bacillus spp*. and *Escherichia coli.* The nanoparticles showed effectiveness against all the three bacteria but with distinct sensitivities.

Keywords: Copper Nanoparticles, Antimicrobial, Resistant, Solvent, Extract.

Introduction

With rise in antimicrobial resistant species , difficultly to treat the microbe has also increased . Misuse of antibiotics and antimicrobials increase selective pressure in bacterial populations , thereby increasing the concentrations of resistant bacteria which continue growing . The World Organization for Animal Health, Food and Agriculture Organization, and World Health Organization have all commented on the serious threat posed by antimicrobial-resistant pathogenic organisms to human and animal health [1] .

Materials ranging from 1nm-100nm are considered to be nanoparticles . It has been reported that metal nanoparticles exhibit a wide spectrum of antimicrobial activity against different species of microorganisms [2] . Among various metal particles, copper nanoparticles have attracted more attention because of their catalytic, optical, electrical and antifungal/antibacterial applications [3,4] . Copper nanoparticles have been prepared using the methods such as thermal reduction, vacuum vapor deposition, microwave irradiation methods , chemical reduction , and laser ablation [5,6]. The approach used for production of nanoparticles are chemical and physical, which are often expensive and potentially harmful to the environment.

In our experiment we have synthesized metal nanoparticles (Copper) using plant extract. The plant species used for this purpose are *Saraca indica* (Ashoka) and *Tridax procumbens* (tridax daisy). Three different solvent system were used for the isolation of nanoparticles from plant extract – water, ethanol and methanol. This approach has been actively pursued in recent years as an alternative, efficient, inexpensive, and environmentally safe method for production of nanoparticles with specified properties. Obtained nanoparticles are then subjected for the antimicrobial test on following bacterial species - *Pseudomonas putida , Bacillus spp. and Escherichia coli* .

Objective of the Study

Isolation of Copper nanoparticles from plant extract of *Saraca asoca* and *Tridax procumbens* and study antimicrobial effects on three bacterial species *Pseudomonas putida , Bacillus spp. and Escherichia coli .*

Methodology

Preparation of Plant Extract

The fresh leaves of *Saraca asoca* and *Tridax procumbens* were collected and thoroughly washed with tap water and air dried at room temperature for 5-7 days, then oven dried at 40^0C to remove the residual

moisture. The dried leaves were pulverized and stored in air-tight containers for further use.

Preparation of Solvents Extract

Three different type of solvents (methanol, ethanol and water) were used for the extraction of plant extract. Following process was performed for preparartion of each solvent extract –

About 10gm of sample was added into the test tube containing with 100 ml of solvent (ethanol/methanol/water). Shake well by using vortex and then test tube stored into the refrigerator for 2 days.After this procedure, the extract was filtered through filter paper, also known as filtration method. The filtrate was concentrated at room temperature.

Preparation of Nanoparticles

50 ml copper sulphate solution of 0.1 mol/l was added drop by drop to 25 ml herbal extract with rapid stirring at 50℃. Then, the pH was adjusted to 10 by addition of 1 mol/l NaOH solution. The obtained precipitate was separated by centrifugation, washed several times by water and ethanol and dried at ambient temperature. The samples were kept at room temperature.

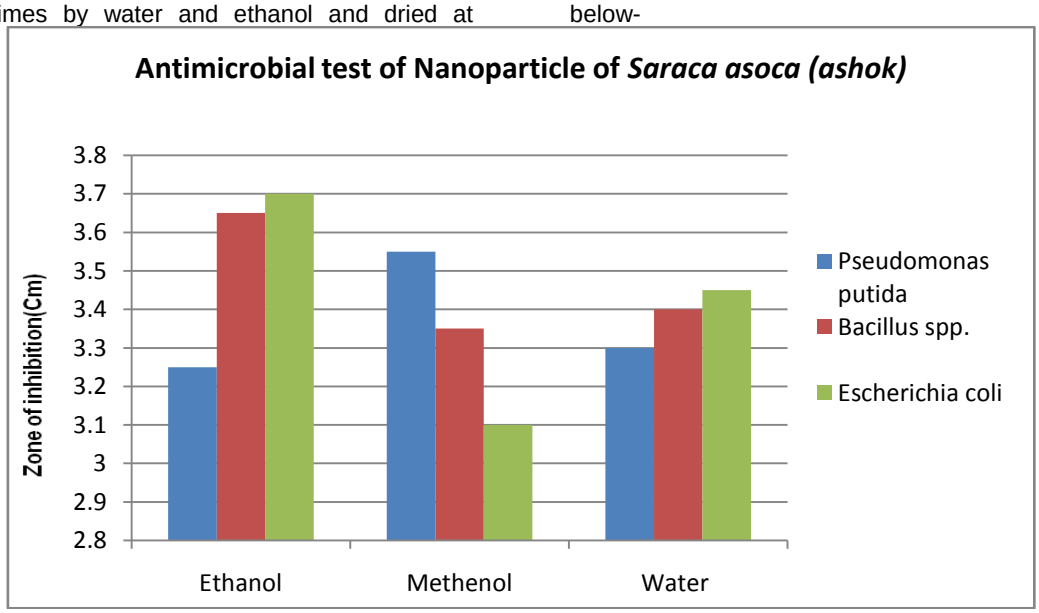
Antimicrobial Test of Nanoparticles

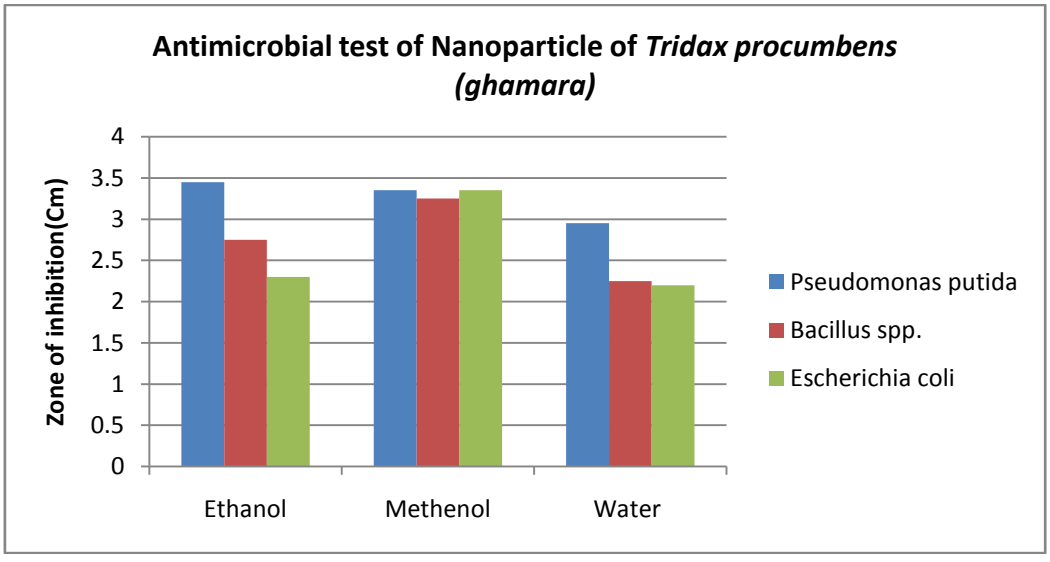
The antimicrobial activity of nano particles was performed by disk diffusion method. In this method Luria Bertani Agar media was prepared for 50 ml and sterilized by autoclave method and immediately poured media into sterile petri plates. The media was allowed to solidify at room temperature after this 100 µl of test organisms were spread on separate plates and after this sterile disk was placed on it and then 10µl of nanoparticles were added into it.

Stastistical Analysis

Different zones of inhibition were formed by performing antimicrobial test of Copper nanoparticles obtained from plants (*Saraca asoca* and *Tridax procumbens)* on bacterial species - *Pseudomonas putida, Bacillus spp. and Escherichia coli.*

The results obtained are shown in graphs below-





Conclusion

The Copper nanoparticles obtained from plant *(Saraca asoca, Tridax procumbens*) extracts were isolated successfully in different solvent (ethanol, methanol, water). These extracts were subjected for the antimicrobial test against three bacteria *Pseudomonas putida, Bacillus spp., Escherichia coli.* As we compare the results for antimicrobial test of nanoparticles obtained from plant extract, it was found that –

Plant	Solvent Extract	Order of Effectivity Against Bacterial Species
Saraca asoca	Ethanol	*Escherichia coli>Bacillus spp.>Pseudomonas putida*
	Methanol	*Pseudomonas putida>Bacillus spp.>Escherichia coli*
	Water	*Escherichia coli>Bacillus spp.>Pseudomonas putida*
Tridax procumbens	Ethanol	*Pseudomonas putida>Bacillus spp.>Escherichia coli*
	Methanol	*Pseudomonas putida=Escherichia coli*>Bacillus spp.
	Water	Pseudomonas putida>Bacillus spp.> *Escherichia coli*

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