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# Preparation of herbal formulation and it's application on nanoparticles synthesis and antibacterial activity

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ABSTRACT

Copper nanoparticles makes important progress in the area of nanotechnology and nanomedicine due to their good optical, electrical and anti-fungal/bacterial application. It is prepared using some methods such as vacuum vapour deposition, microwave irradiation methods, chemical reduction and laser ablation. The chemical reduction method is simple, inexpensive and gives a liable control of geometrical nanoparticle characteristics like size and shape. 20 millimolar of 80 ml copper sulphate prepared using double distilled water. The plant extract is added with the metal solution and was made into 100 ml solution. The synthesised nanoparticles solution is preliminarily characterized by using UV- vis-spectroscopy, 3ml of the solution is taken in cuvette and scanned in double beam UV-vis- spectrophotometer from 300 nm to 700 nm wavelength. The agar well diffusion method is used. Different concentration of Cu NPs was tested against Staphylococcus aureus, Streptococcus mutans (gram +), and Pseudomonas sp. The result reveals that *Moringa Oleifera* with *Andrographis paniculata* formulation mediated with copper nanoparticles show effective antibacterial activity. CuNPs ex significantly higher activity with an increase in the zone of inhibition diameter. The plant extract is observed to be dark green, and the copper nanoparticles are seen to be in light greenish in colour. They can be used in toothpaste and oral medicines due to their antibacterial activity. Nanoparticles are expected to be used in future for the effective drug systems and immunity against diseases.

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## INTRODUCTION

Copper nanoparticles makes important progress in the area of nanotechnology and nanomedicine for a long time due to their good optical, electrical and anti-fungal/bacterial application (Tiwari *et al.*, 2016; Karthiga *et al.*, 2018a; Rajeshkumar *et al.*, 2018a). It is prepared using some methods such as vacuum vapour deposition, microwave irradiation methods, chemical reduction and laser ablation (Karthiga *et al.*, 2018b; Rajeshkumar, 2018; Rajeshkumar and Agarwal, 2018).

Among all the methods, the chemical method is found to be the best method in preparation of CuNPs. The chemical reduction method is simple, inexpensive and gives a liable control of geometrical nanoparticle characteristic, i.e., size and shape. It also has disadvantages like it has some effect over the environment, because of consumption and elimination of toxic particles or hazardous chemical reducing agents (Rajeshkumar *et al.*, 2018b). Cop-

per nanoparticles can serve as potential candidates for the application such as nanomedicine, water treatment and food processing (Perreault *et al.*, 2012).

Valodkar reported biosynthesis of copper nanoparticles, using the plant Euphorbia nivulia and exhibit biological effects on tumour cell (Grigore *et al.*, 2016; Sivaraj *et al.*, 2014a) . In recent years, the nanoparticles are used in various fields like waste water treatment, environmental remediation, consumer products, medical pharmaceutical, energy and electric industries. The chemical properties of synthesised Copper oxide nanoparticles are characterised by analytic techniques.

## MATERIALS AND METHODS

### Synthesis of nanoparticles

20 millimolar of 80 ml Copper sulphate solution prepared using double distilled water. The Herbal formulation is added with the metal solution and was made into a 100ml solution. The colour change was observed visually, and photographs were recorded. The solution is kept in magnetic stirrer/ orbital shaker for nanoparticle synthesis.

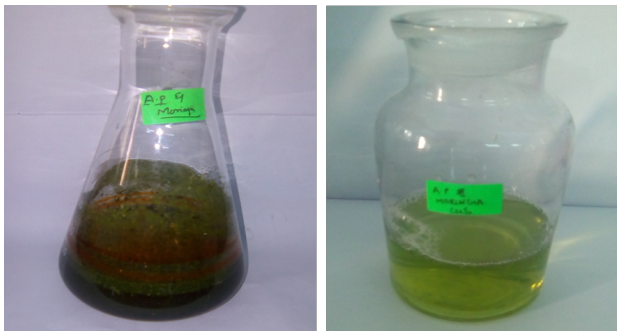

**Figure 1: Visual observation (a) Plant Extract (b) CuNPs**

### UV-vis spectrophotometer

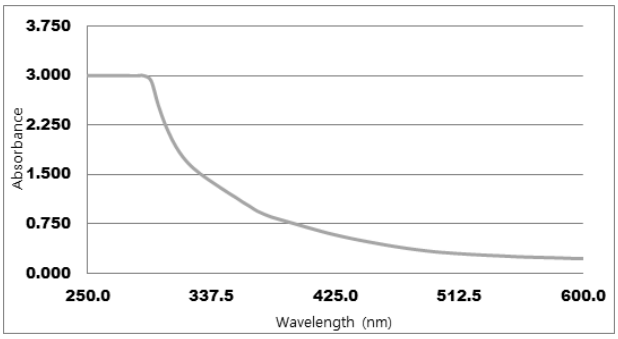


**Figure 2: UV-vis spectrum of CuNPs**

### Characterisation of nanoparticles

The synthesised nanoparticles solution is preliminarily characterised by using UV- vis-spectroscopy,

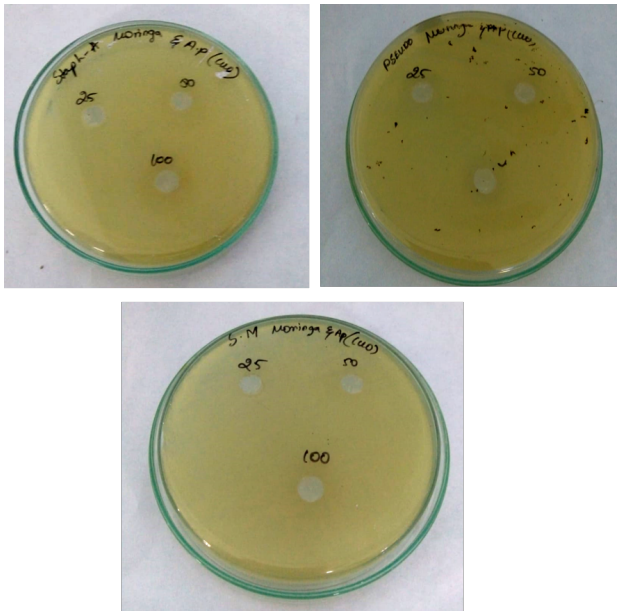

**Figure 3: Antibacterial activity of Copper nano particles against oral pathogens**

3ml of the solution is taken in cuvette and scanned in double beam UV-vis- spectrophotometer from 300 nm to 700 nm wavelength. The results were recorded for the graphical analysis. The prepared nanoparticles powder is morphologically analysed using a transmission electron microscope.

### Antibacterial activity of nanoparticles against oral pathogens

The agar diffusion method is used to demonstrate the antibacterial action of copper nanoparticles. Different concentration of Cu NPs is tested against Staphylococcus aureus, Streptococcus mutans (gram +), and Pseudomonas sp. The new bacterial suspension is dispersed over the surface of the Muller Hinton agar plate. Many concentration of nanoparticles (20, 40 & 60 $\mu$L) is incorporated into the wells and plate is incubated at 37°C for 24 hours. The antibiotics are utilised in positive control. Zone of inhibition is recorded in each plat.

## RESULTS AND DISCUSSION

### Visual observation

The plant extract is observed to be dark green, and the copper nanoparticles are seen to be in light greenish in colour (Figure 1 ).the colour change indicates the nanoparticles synthesis (Gunalan *et al.*, 2012; Guidelli *et al.*, 2011).

### UV visual spectroscopy

Ultra violet spectra of Copper oxide particles synthesised plant extract at room temperature. It is generally recognised that UV-vis spectra can be used

in the examination of the size and shape-controlled nanoparticles in the aqueous solution with 200-800nm wavelength range (Phiwdang *et al.*, 2013; Ananth *et al.*, 2015). The particle shape is spherical and size in a range of 2-100nm. The graph reached its peak at the wavelength of 300nm. The optical absorption spectra of noble metal nanoparticles is found to exhibit excellent optical properties due to the phenomenon of surface plasmon resonance, which proceeds to longer wavelength and increasing particle size simultaneously (Figure 2).

**Antibacterial activity**

Antibacterial activity of copper nanoparticles is against gram-positive and gram-negative bacteria (Figure 3). A copper nanoparticle has an efficient and bactericidal effect against oral pathogens. The growth inhibition of cells is because of the distraction of cell membrane by copper oxide nanoparticles, which leads to break down of cell enzymes (Dagher *et al.*, 2014; Sivaraj *et al.*, 2014b). The result reveals that the *Moringa Oleifera* mediated with copper nanoparticles show powerful antibacterial activity.

CuNPs exhibition significantly higher activity with an increase in the zone of inhibition diameter.

## CONCLUSION

Nanoparticles due to its antibacterial property and efficient effect against the oral pathogens the is used in toothpaste and oral medicines. Hence the nanoparticles are expected to be used in future for the effective drug systems and immunity against diseases.

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