

# Antimicrobial Activity of Mouthwash with Copper Nanoparticles Using *Lepidium sativum* Seeds Extract

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**Abstract:-** The research study aims to particularly evaluate the antimicrobial activity of mouthwash containing copper nanoparticles, by synthesized using *Lepidium Sativum* (garden cress) seeds extract. As increasing concern over the antimicrobial resistance of the exploration of alternative antimicrobial agents. Copper nanoparticles have shown perfect promising antimicrobial properties due their high surface area and potential for disrupt microbial membranes. *Lepidium Sativum* seeds extract as known for its bioactive compounds, which may be further enhance the antimicrobial efficacy and potency. Our mouthwash was tested against the panel of common oral pathogens and its efficacy and potency were compared with marketed conventional mouthwash formulations. Our research results indicated that the mouthwash with copper nanoparticles and *Lepidium Sativum* seeds extract exhibits good significant antimicrobial activity, making it a perfect potential candidate for maintaining oral hygiene.

## I. INTRODUCTION

Oral health is very essential for overall wellbeing with maintaining proper oral hygiene is very critical in preventing various oral infections and diseases. The marketed mouthwashes often contain various chemical agents that can be contribute to antimicrobial resistance and may have adverse effects on oral microbacteria. Therefore, this is our growing interest to exploring natural antimicrobial alternatives. The copper nanoparticles have attracted attention due to their proper antimicrobial properties, which have been demonstrated against a wide range of microorganisms. As this *Lepidium Sativum* seeds extract has been reported by us to contain bioactive compounds that possess good antimicrobial potential. our research study aims to proper combine the antimicrobial properties of copper nanoparticles with *Lepidium Sativum* seeds extract to develop an effective mouthwash.

## II. METHODS WITH MATERIALS EXPLANATION

As *Lepidium Sativum* seeds extract purchased from online. We use soxhlet apparatus for the proper extraction method. As we used to reduced into powder form of 100.001gm after we added 1litre ethanol. Our extraction lasted 7hr57min to 9hr59min until about the soluble constituents in the solvent until dissolution of soluble constituents. After we filtrate by a rotary evaporator as used to properly evaporated solvent used semisolid mass. After we collected the extract and properly stored under 4°C for use.

### ➤ Preparation of Copper nanoparticles with *Lepidium Sativum* seed extract

As for synthesis copper nanoparticles we taken copper sulphate solution (1mM) was properly prepared and 100ml added in 10ml of *lepidium sativum* seed extract. After we mixed well until colour of the solution changes. Our indication of properly successful synthesis of copper nanoparticles. For 23hr45min we age the solution, as brown colour precipitate settled at the bottom. After washed and filtered with distilled water. As we centrifuged it 5000rpm for only 14min57sec. After we collected the perfect copper nanoparticles and dried in an oven at 79°C.

### ➤ Characterization of Materials

As synthesized copper nanoparticles the XRD, X-Ray Diffraction analysis perfectly X'pert machiene was done properly. The plot of perfect intensity XRD shows of scattered at different angles by sample. From pattern of XRD crystalline phases of sample can be determined properly as absence or presence of the amorphous materials assessed.

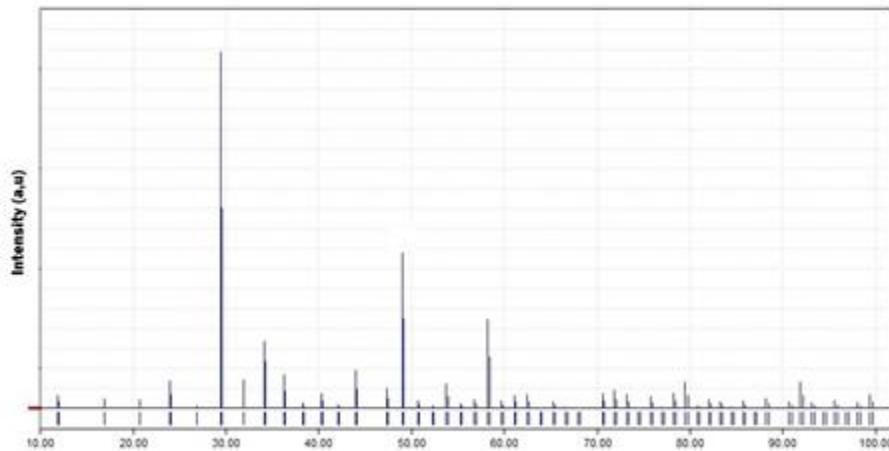


Fig 1 shows XRD analysis of copper nanoparticles with Lepidium Sativum seeds extract, the x-axis represent 2θ degree region, the copper nanoparticles has characteristic peaks at 2θ regions of degrees, which we perfectly watch the consistent with standard hap phases, the diffraction peaks markedly broader suggesting prepared powder particles in nanosize

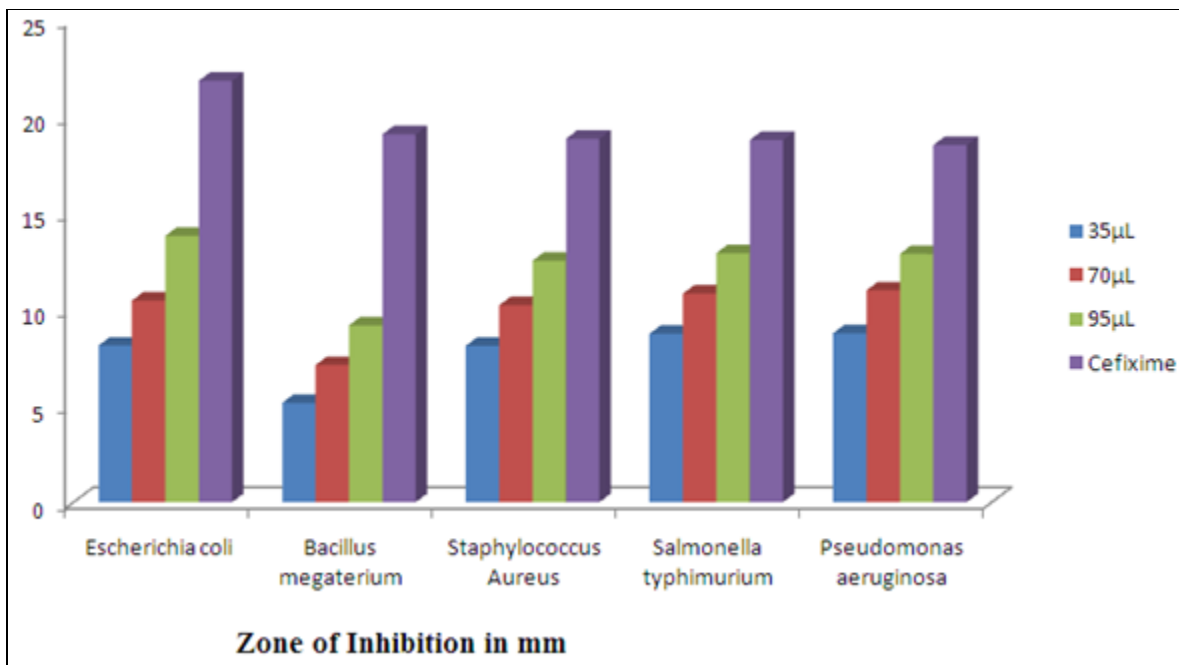


Fig 2 Antimicrobial Activity of Mouthwash of Copper Nanoparticles with Lepidium Sativum Seeds Extract

➤ Mouthwash Solution Preparation

By using lepidium sativum seed extract copper nanoparticles with ethanol, distilled water, sucrose, sodium benzoate, peppermint oil oil, polyoxyethylene-polyoxypropylene.as copper nanoparticles of lepidium sativum seed extract is main solvent for solubilize this ingredients.as peppermint oil used as flavouring agent and we used sodium benzoate as preservative.

Table 1 Mouthwash Solution Preparation

Organisms	Zone of Inhibition in mm			Cefixime
	35µL	70µL	95µL	
Escherichia coli	8.12 ± 1.09	10.45 ± 1.07	13.81 ± 1.01	21.84 ± 1.17
Bacillus megaterium	5.15 ± 1.98	7.11 ± 1.83	9.17 ± 1.63	19.07 ± 1.51
Staphylococcus Aureus	8.11 ± 1.29	10.21 ± 1.38	12.52 ± 1.64	18.84 ± 2.13
Salmonella typhimurium	8.73 ± 1.04	10.81 ± 1.72	12.91 ± 1.81	18.77 ± 0.54
Pseudomonas aeruginosa	8.76 ± 1.75	10.98 ± 1.11	12.87 ± 1.43	18.51 ± 1.11

### ➤ *Antimicrobial Activity*

By well using agar diffusion method we determined the mouthwash against the bacterial pathogens such as *Escherichia coli*, *Bacillus megaterium*, *Staphylococcus aureus*, *Salmonella typhimurium*, *Pseudomonas aeruginosa*. As dispersed evenly of secondary cultures of microbial suspension of muller hinton and rose bengal agar plates always using a sterile spreader. We used different concentrations of mouthwash of 35µL, 70µL and 95µL were properly incorporated through of a sterile micropipette in the wells of created on the basis of agar plate in the sterile cork borer. After we incubated precisely 35°C for 25hrs03min to 46hrs43min. As in this research we used marketed antibiotic cefixime 20mg/ml used positive control against bacterial pathogens. As we recorded about the zone of inhibition in mm compared to marketed antibiotic. All this test were replicated into triplicate for perfect analysis.

## III. RESULTS AND DISCUSSION

### ➤ *Minimum Inhibitory Effect of Bactericidal Concentration*

It will be shown in the figure.

Our research characterization of the synthesized copper nanoparticles of *Lepidium sativum* seeds extract confirmed their proper size range and spherical morphology. Our formulated mouthwash formulation containing both copper nanoparticles and *Lepidium Sativum* seeds extract exhibited the proper highest antimicrobial activity against the tested oral pathogens such as *Escherichia coli*, *Bacillus megaterium*, *Staphylococcus aureus*, *Salmonella typhimurium*, *Pseudomonas aeruginosa*. This research significantly inhibited the growth of as compared to the control group and individual mouthwash formulations.

Our research enhanced antimicrobial activity can be attributed to the proper synergistic effect of copper nanoparticles with *Lepidium sativum* seeds extract and has bioactive compounds present in *Lepidium Sativum* seeds extract. This copper nanoparticles disrupt the microbial cell membrane, leading for cell death, while the *Lepidium Sativum* seeds extract always provide additional antimicrobial compounds that target very specific microbial pathways.

## IV. CONCLUSION

Our formulated mouthwash formulation containing copper nanoparticles with *Lepidium Sativum* seeds extract perfectly demonstrated potent antimicrobial activity against common oral pathogens. This combination of these two natural antimicrobial agents shown promisingly in developing effective and sustainable oral care products. Further research is needed to investigate the safety, long term efficacy, and commercial viability of this mouthwash for maintaining oral hygiene and preventing oral infections with animal study and proper human trial.

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