Copper Nanoparticles Synthesized Using Green Approach from *Ananas comosus* Waste and Their Antimicrobial Activity; A Review

Nur Diyana Zulpahmi[1], Siti Aisha Na'illa Che Musa[1], Wan Zuraida Wan Mohd Zain[1,2], Nur 'Amira Hamid[1], Nurul Wahida Ramli[1], Fazlena Hamzah[2]

[1]*Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA(UiTM), Jasin Campus, 77300 Merlimau, Melaka, Malaysia*

[2]*Biocatalyst and Biobased Material Technology Research Group, School of Chemical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam*

**Corresponding Autor's Email: nailla@uitm.edu.my*

Abstract: *Ananas comosus* (*A.comosus*) is widely cultivated in Malaysia and abundant of plant waste was created from the harvesting process. Up until today, exploration on the optimum utilization of *A.comosus* plant waste was minimumly reported. This review was extensively revealed on the waste extract of *A.comosus* phytochemical compounds that can potentially act as reducing and stabilizing agent for copper nanoparticles (CuNPs) via green synthesis methods. This review also provided the antimicrobial activity of the synthesized CuNPs. The information gather in this review will contributed towards a further development in copper nanoparticles synthesized using green approach.

Keywords**:** *Ananas Comosus*, Antimicrobial, Copper Nanoparticles, Waste, Green Synthesis.

INTRODUCTION

Ananas comosus waste grows correspondingly as its output increases which can results in microbial deterioration and major environmental issues (Hikal *et al.*, 2021). This review paper will discuss on the potential of specific phytochemical constituent from *A. comosus* waste extracts as the source of stabilizing agents for green synthesis of metallic nanoparticles. The scope of discussion was narrowed down to the green synthesized CuNPS and their antimicrobial activities.

1. SUSTAINABILITY OF A. COMOSUS

A. comosus primarily has its waste in the form of crown, peel, stem, and core [1]. Utilizing A. comosus waste into a profitable merchandise was already acknowledged as it offers the most environmentally friendly technique and it is also attributed to their functional components and characteristics [2].

2. GREEN SYNTHESIS OF NANOPARTICLES USING A. COMOSUS WASTE EXTRACT AND THEIR ANTIMICROBIAL ACTIVITY

Many parts of A. comosus waste extract have been successfully used to synthesize various types of nanoparticles and exhibit great antimicrobial activity. The leaves were used to synthesize gold nanoparticles [3] while the fruit for the synthesis of copper nanoparticles [4].

3. GREEN SYNTHESIS OF CUNPS USING PLANTS EXTRACTS AND THEIR ANTIMICROBIAL ACTIVITY

The synthesis of CuNPs is the most commonly utilized material globally and is used in antibacterial and antifungal processes due to their low cost and ease of synthesis [4]. Several studies make use of the CuNPs synthesized from various plants that show great antimicrobial activity such as Persea americana [5], C. vitiginea [6] and Mint leaves [7]. This shows that CuNPs also have a big potential to be synthesized using A. comosus waste extract.

CONCLUSIONS

Different plant extracts provide different properties of synthesized CuNPs in terms of shape, and particle size and portrayed different antimicrobial activities. Copper nanoparticles mediated from *A. comosus* fruit extract are portrayed among the best antimicrobial activity.

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