METAL NANOPARTICLE SYNTHESIS MEDIATED BY CANNABIS SATIVA EXTRACT AND THEIR ANTIMICROBIAL ACTIVITY

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INTRODUCTION

The popularity of metal nanoparticle use has been on the rise since their antimicrobial activity was first proven. The physico-chemical production of these nanoparticles is, however, not very eco-friendly neither cost-effective. Successful biosynthesis of metal nanoparticles appears to be an interesting alternative. While the synthesis of nanoparticles mediated by microbial cultures or lysates has proven effective, the use of plant extracts, especially waste product extracts, seems even more plausible when it comes to the possible environmental impact.

METHODS

Extract preparation

Homogenized *Cannabis sativa* were extracted into 40% ethanol solution (24 h, room temperature) and then filtered twice (0.8 and 0.2 µm).

Nanoparticle synthesis

The solution of metal ion containing substance (nanoAg - 10 mM $AgNO_3$, nanoAu - 2 mM $HAuCl_4$) was mixed with 10 vol% of Vitis vinifera extract and left to react (1 week).

Nanoparticle characterization

The production of nanopartices was detected using UV-Vis spectra analysis. Metal nanoparticles produce a characteristic peak depending on their size, morphology and composition.

After that, nanoparticles were analyzed using TEM microscopy for further investigation of their morphology and level of polydispersity.

Antimicrobial tests

- *Pseudomonas aeruginosa* DBM 3081
- *Pseudomonas aeruginosa* DBM 3777

Planktonic cells: Cells were cultivated in the presence of nanoAg or nanoAu (24 h) in Bioscreen C, growth curves were then constructed and MICs were established..

CONCLUSION

Silver and gold nanoparticle synthesis can be mediated by an agricultural waste product (*Cannabis sativa*) extract.

The nanoparticles produced were polydisperse and where it comes to nanoAg, spherical in shape, whereas some of the gold nanoparticles exhibited triangular or polygonal morphology.

The effect of nanoparticles against gram negative bacterium *P. aeruginosa* varied greatly. Silver nanoparticles exhibited more than 90% inhibition at 0.3 % v/v for both strains tested (PA 3081 and PA 3777), while gold nanoparticles achieved only 50% inhibition when 31.3 or 40.6 % was used, respectively.

RESULTS

TEM analysis

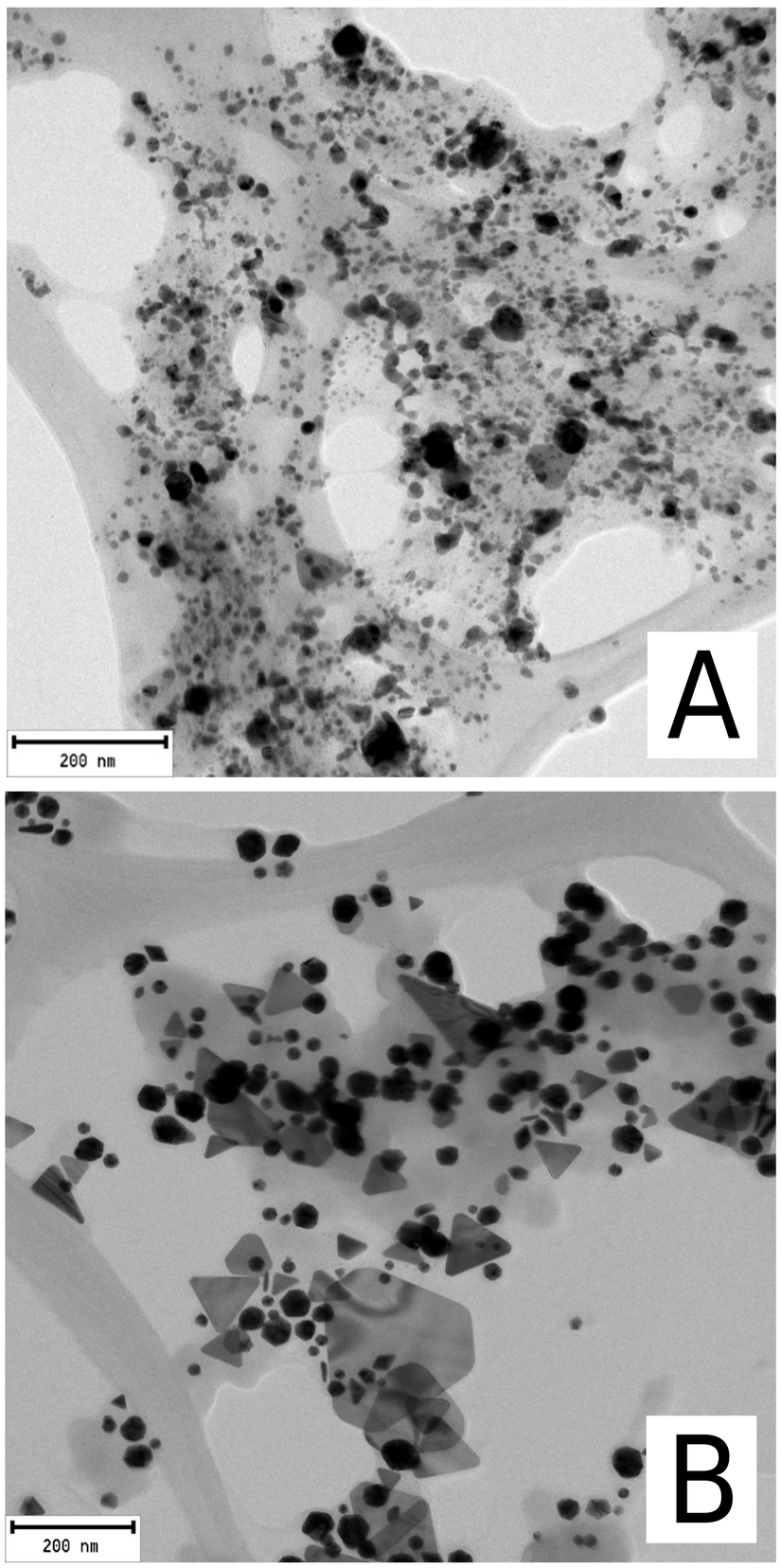

Figure 1: TEM images of synthesized nanoparticles; A - nanoAg, B - nanoAu

UV-VIS analysis

nanoAg:
Characteristic peak: 450 nm

nanoAu:
Characteristic peak: 540 nm

Antimicrobial effects

nanoAg (MIC 90):
PA 3081 - < 0.3 % v/v
PA 3777 - < 0.3 % v/v

nanoAu (MIC 50):
PA 3081 - 31.3 % v/v
PA 3777 - 40.6 % v/v

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