

TITLE: IMPROVEMENTS IN *PLINIA CAULIFLORA* ANTIMICROBIAL ACTIVITY BY THE EXTRACT-MEDIATED SYNTHESIS OF SILVER AND GOLD NANOPARTICLES

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ABSTRACT:

In view of the increased antimicrobial resistance in the clinical setting over the last years, there is a growing need to investigate new drugs. Plant extracts present known antimicrobial properties and can provide new promising candidates as new antibiotics, as well as silver and gold nanoparticles, which have applications as antimicrobial agents. Green synthesis of nanoparticles using plant extracts offers an eco-friendly approach and a very effective method in developing a rapid, clean and nontoxic technology. In this study, silver and gold nanoparticles were synthesized from the aqueous extracts from *Plinia cauliflora* leaves and fruits (“jabuticaba”), used as traditional Brazilian medicine. The formation of nanoparticles was confirmed using the surface plasmon resonance band at 415 nm for the silver nanoparticles (JabAgNPs) and, at 530 nm, for gold nanoparticles (JabAuNPs). Zeta potential showed good stability of prepared solutions. Spherical shape particles with sizes around 15±4 nm for JabAgNPs and 7±5 nm for JabAuNPs were observed by transmission electron microscopy. The antimicrobial activity of the plant extracts (leaves or fruits, JabAgNPs, and JabAuNPs, with final dilution of 1:20) after 20 hours of incubation was investigated using the broth microdilution method with the microorganisms: ATCC strains of *Escherichia coli*, *Klebsiella pneumoniae*, *Salmonella* Thiphymurium, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Bacillus subtilis*; and clinical isolates of methicillin-resistant *S. aureus* (MRSA), *Enterococcus faecalis* and *Escherichia coli* O44:H18 EAEC042. Almost of the microbial species tested showed higher inhibition percentual when exposed to fruit extract than compared to leaf extract. Both plant extracts showed the highest activity against Gram-positive bacteria (13.42 to 85.72%), whereas a lower Gram-negative and yeast inhibition (14.07 to 56.11%). It was observed higher inhibition percentual of all the tested microorganisms after treatment with JabAgNPs (94.97% to 100%), than with of JabAuNPs, which ranged from 0% - 84.75%, with a mean of 41.43%. JabNPs could induce oxidative stress due to the production of reactive oxidative species (ROS), culminating with damage to the cell membrane, DNA, mRNA, and ribosomes. These results showed the improving of the potential application of *Plinia cauliflora* extracts as an antimicrobial agent after plant extract-based AgNPs and AuNPs synthesis.

Keywords: metallic nanoparticles, green synthesis, *Plinia cauliflora*, antimicrobial activity

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