Nature's Nanofactory:

Leveraging Medicinal Plants as Novel Therapeutics

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Introduction

Antibiotic resistance is one of the top 10 global public health threats.

Silver is known to have antibacterial properties.

Metallic nanoparticles are showing good potential as novel antibiotic agents due to their multi-pronged approach as shown in Figure 1.

However, chemical synthesis of the nanoparticles requires use of toxic chemicals and uniform size and shape are hard to achieve.

Green synthetic strategies coupled with traditional medicine results in an eco-friendly strategy for nanoparticle synthesis and the added benefit of medicinal phytochemicals being incorporated on the nanoparticle thereby resulting in a potentially potent antibacterial agent.

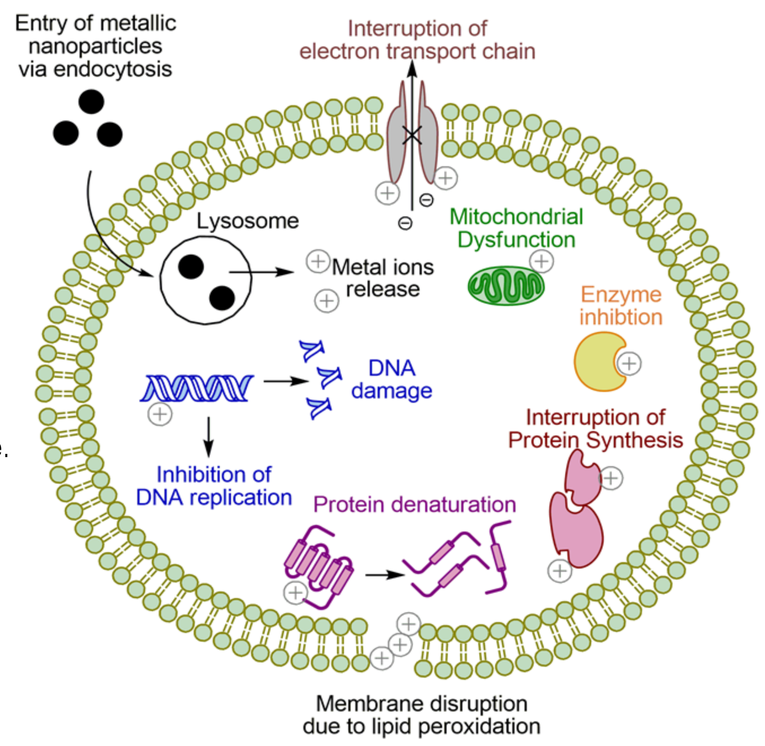
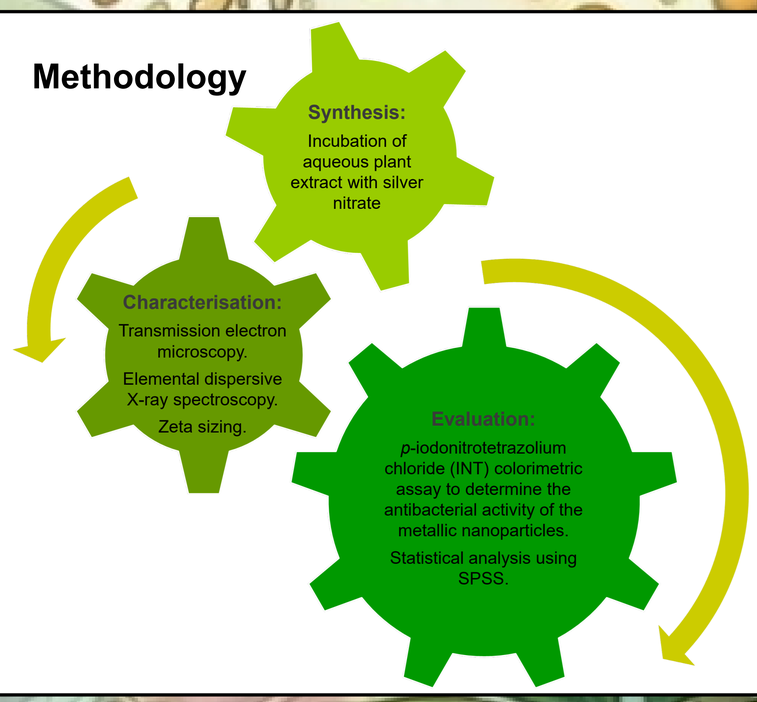


Figure 1: Mechanisms of antibiotic action of metallic nanoparticles.

Aim

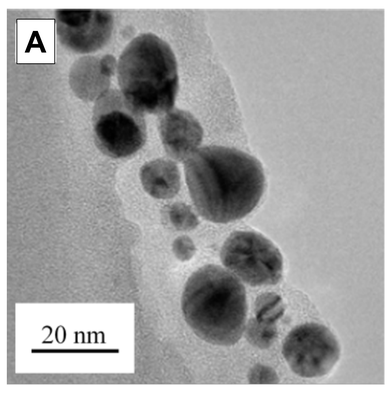
Synthesize stable silver nanoparticles using aqueous extract of *Siphonochilus aethiopicus* and evaluate their antibiotic potential.

Methodology



Nanoparticle Characterisation

Stable, negatively charged silver nanoparticles within a narrow size range was produced as seen in Figure 2 below.



C	Zeta sizing results
Hydrodynamic size (d.nm)	159 ± 1,65
Polydispersity Index	0.3 ± 0.02
Zeta-Potential (mV)	-40.5 ± 0.21

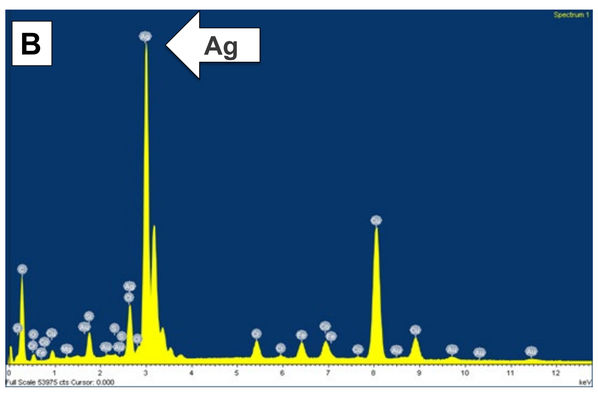


Figure 2: A) Transmission electron micrograph, B) EDX profile and C) Zeta sizing results of silver nanoparticles produced from aqueous *S. aethiopicus* extract. Average nanoparticle sizes were 5-18 nm.

Antibacterial evaluation

Silver nanoparticles produced by *S. aethiopicus* extract showed excellent antibacterial activity against both Gram-negative and Gram-positive bacterial species as seen in Figure 3 below, with concentrations of 50 µg/ml and above performing similarly or better than the positive control.

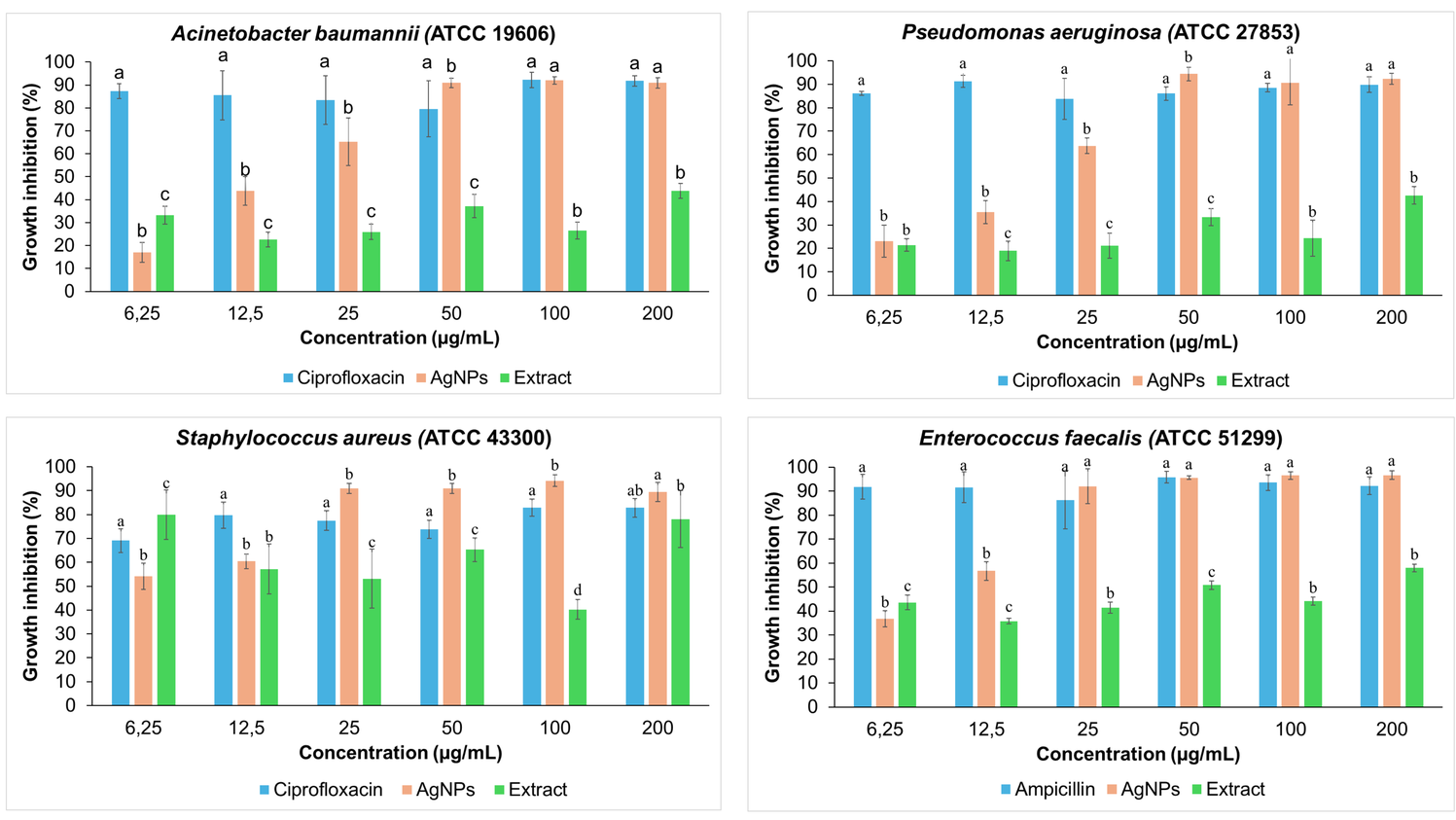


Figure 3: Antibacterial activity of silver nanoparticles (AgNPs) and *S. aethiopicus* aqueous extract (extract) against various bacterial species with ciprofloxacin or ampicillin serving as a positive control. Results are expressed as mean ± SD. Bar graphs with different letters indicate significant differences ($p<0.05$) within the same concentration.

Conclusion

Phytochemicals together with a silver nanoparticle core can result in a synergistic antibiotic effect.

Due to their multi-pronged mechanisms of action, these nanoparticles could serve as novel antibiotics that are not prone to resistance.

Therapeutic plant species could be an environmentally friendly approach to synthesise nanoparticle that could potentially be used as antibiotic agents.

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