Grren Synthesis, Characterization & Evaluation of Antioxidant properties of silver nanoparticles derived from marine brown algae *Padina sp.*

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INTRODUCTION

- Nanotechnology (1-100nm), the green synthesis of silver nanoparticles (AgNPs) provides an eco-friendly therapeutic approach due to their stability and safety.
- *Padina commersonii* , an edible brown macroalgae found along Sri Lanka's coastal beaches, is recognized for its rich bioactive compounds, and health benefits.
- The bioactive compounds found in *Padina Commersonii* can reduce silver metal ions to form nanoparticles, acting as stabilizers and capping agents.
- These AgNPs exhibit strong antioxidant properties, offering therapeutic benefits for oxidative stress-related diseases like diabetes and cancer

OBJECTIVES

- To green synthesize silver nanoparticles using *Padina sp.* extract, characterize these silver nanoparticles, and assess their antioxidant activity

METHODOLOGY

- Silver nanoparticles were synthesized by mixing the extract of *Padina commersonii* with silver nitrate.
- The resulting nanoparticles were characterized using several techniques, including UV-Vis spectroscopy, Dynamic Light Scattering (DLS), Zeta potential Scanning Electron Microscopy (SEM), Energy Dispersive X-ray (EDX) analysis, X-ray Diffraction (XRD), FTIR spectroscopy, and Raman spectroscopy.
- The antioxidant properties were evaluated by 2,2-Diphenyl-1-picrylhydrazyl **(DPPH)** assay and 2,2'-Azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) **ABTS** assay

RESULTS

•Visual colour change -**Pale yellow to reddish-brown within 24- 48h**

Nanoparticle Characterization

•UV-Vis Spectroscopy (**Peak at 424 nm)**

•DLS -Average size: **79.34 nm**

•Zeta Potential Analysis **(-21.5 mV, Stable)**

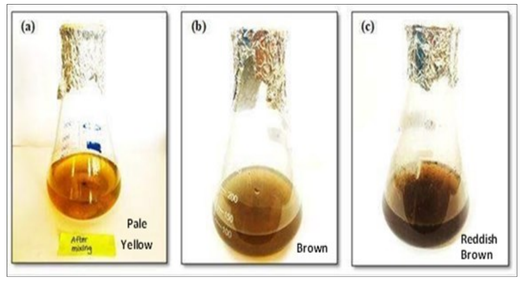
•SEM: **Smooth, spherical nanoparticles, without aggregation.**

•EDX: **20% silver content.**

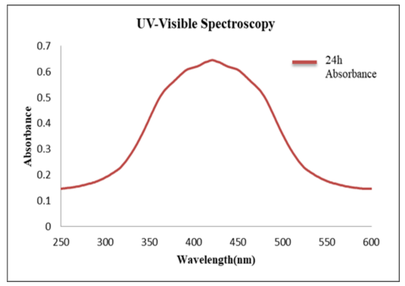
•XRD: **Face-centered crystalline structure**

•FTIR & Raman- Capping agents-**Proteins, phenolic compounds, and amines**

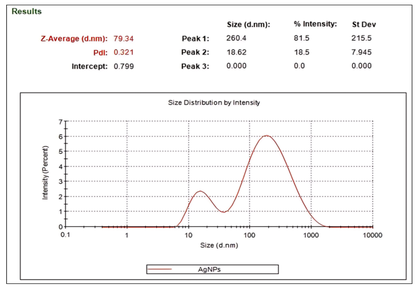
Reducing agents- **Polyphenolic compounds and flavonoids**



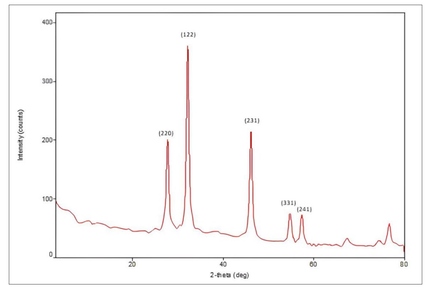
Colour change of AgNPs observed over
(a) 30min (b) 24h (c) 48h



UV–Visible spectrum of the AgNPs



Particle size analysis of AgNPs



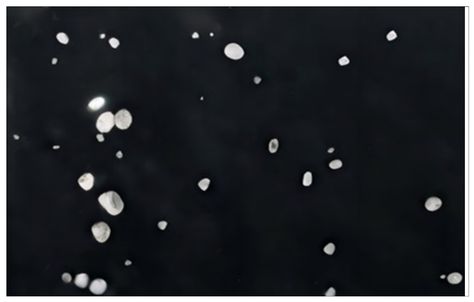
XRD pattern of AgNPs

Antioxidant Efficacy

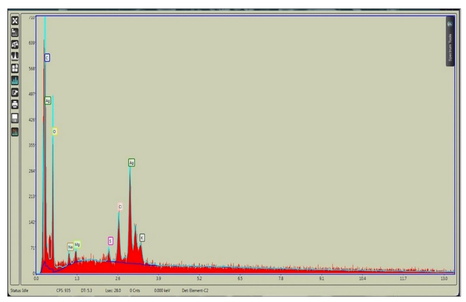
•The lower the IC_{50} value, the greater the antioxidant potential.

Table 1: Antioxidant activities of Test Samples

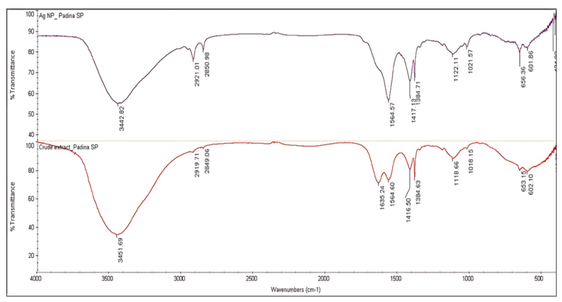
Test Sample	DPPH IC_{50} (µg/ml)	ABTS IC_{50} (µg/ml)
Trolox (standard)	6.01±1.73[a]	19.5±9.861
Extract of *Padina commersonii*	307.69±9.32[b]	252.45± 8.033
AgNPs synthesized using *Padina commersonii*	271.17±3.99[c]	195.03± 5.7535



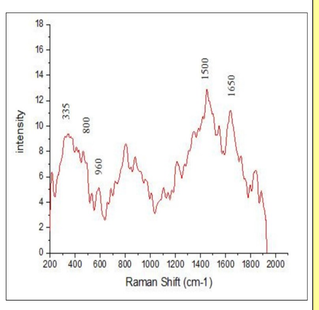
SEM image of AgNPs



EDX spectrum of AgNPs



FTIR spectrum of *Padina sp.* extract & AgNPs



Raman spectrum of AgNPs

CONCLUSION

- Silver nanoparticles synthesized by green method using *Padina commersonii* show potential as an eco-friendly, sustainable therapeutic approach for diseases
- Characterization confirms the AgNPs are nano in range, smooth, spherical, stable, crystal and dispersed without aggregation.
- The AgNPs synthesized using *Padina commersonii.* exhibited greater antioxidant efficacy compared to the crude extract of *Padina commersonii*
- Can be used to develop food products, food packaging, skin care, haircare, wound care and disease treatment

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