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2022/2023 PhD Thesis Abstract

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RT: **Biological Activities of Alcohol-Based Extracts and the Silver Nanoparticles Mediated from Tamarindus Indica and Adansonia digitata Fruits on Urinary Tract Pathogens**

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AB: Urinary Tract Infection (UTI) is one of the most common human bacterial infections which affect approximately 150 million people annually. While increasing antibiotic resistance has adversely affected treatment outcome due to ineffectiveness of conventional antibiotics, silver nanoparticles (AgNPs) have been widely used for targeted drug delivery. However, the activities of *Adansonia digitata* and *Tamarindus indica* fruit extracts, their AgNPs and chemical compositions have been poorly elucidated. Therefore, this study evaluated the chemical composition and antibacterial activities of both crude and extract-mediated AgNPs from *A. digitata* and *T. indica* fruits against UTI.

Dry fruits of *A. digitata* and *T. indica* were pulverized. Extracts were obtained by maceration using 70% methanol and ethanol as solvent. Chemical compounds in eight extracts from the fruits comprising two extracts from each of the solvents and two extracts from each of their AgNPs were determined using Gas Chromatography-Mass Spectrometry (GC-MS). The crude and AgNPs extracts were characterized using UV-Visible spectrometry (UV-VIS), Fourier Transformed Infrared (FTIR), Scanning Electron Microscope (SEM), and Energy-Dispersive X-ray (EDX). Radical scavenging activities were investigated with 2,2-Diphenyl-1-picrylhydrazyl (DPPH), Ferric Reducing Antioxidant Power (FRAP), Total Antioxidant Capacity (TAC), Total

Phenolic Content (TPC), and Total Flavonoid Content (TFC) analyses. Bacteria previously identified were used for antibacterial assay and cytotoxicity potential was evaluated in vitro using *Artemia salina*. Data were analyzed using descriptive statistics.

In *A. digitata* fruit, the GC-MS analysis revealed the presence of 42, 28, 26, and 23 chemical compounds in methanol, methanol-AgNPs, ethanol, and ethanol-AgNPs extracts, respectively. In *T. indica* fruit, there were 36, 44, 37, and 21 chemical compounds in methanol, methanol-AgNPs, ethanol, and ethanol-AgNPs extracts, respectively. Prominent chemical compounds identified include 5-hydroxymethylfurfural, dihydro-3-methylene-2,5-furandione, beta-sitosterol, 5 β ,7 β H,10 α -eudesm-11-en-1, n-hexadecanoic acid, 2-hydroxy-cyclopentadecanone, and (Z)-2-hydroxy-1-(hydroxymethyl)ethy, 1-9-octadecenoic acid ester. The FTIR identified functional groups responsible for the bio-reduction of AgNPs as carboxylic acid, amines, alcohols, and phenols at 3417–601 cm⁻¹. The SEM showed the AgNPs were spherical in shape. The average size of the methanol-AgNPs were <10 nm, while those of ethanol-AgNPs were \leq 350 nm. The EDX identified silver (72%) as the most prominent element in the AgNPs. The values of TPC, TFC, DPPH, TAC, and FRAP of the extracts were 308.01, 90.00, 82.52, 19.05, and 5.89 μ g GAE/mg, respectively. In AgNPs, those of TPC, TFC, DPPH, TAC, and FRAP were 477, 120, 89.51, 57.14, and 15.50 μ g GAE/mg, respectively. The minimum inhibitory concentration values >100 μ g/mL was observed against *Mammaliicoccus sciuri*, *Proteus mirabilis*, *Escherichia coli*, and *Pseudomonas aeruginosa* while that of AgNPs ranged between 0.19 and 0.78 μ g/mL. Ethanol-AgNPs extracts of both fruits exhibited LD50 of 6.23 μ g/mL against *A. salina*.

The study concluded that *A. digitata* and *T. indica* AgNPs extracts displayed higher biological activities against urinary tract pathogens compared to the crude extract. The study recommended the development of *A. digitata* and *T. indica* extracts-based AgNPs for the treatment of UTI.

Keywords: *Adansonia digitata*, Compound, Silver nanoparticles, *Tamarindus indica*, Urinary tract infection

Word Count: 468

Abbreviations: *RFN: Researcher's Full Name, RD: Researcher's Department, RS: Researcher's School, RE: Researcher's Email, RAE: Researcher's Alternate Email, RP: Researcher's Phone Contact, RT: Registered Title, MS: Main Supervisor, ME: Main Supervisor's E-mail Address, SP: Main Supervisor's Phone Contact, CS: Co-Supervisor, CE: Co-Supervisor's E-mail Address, CP: Co-Supervisor's Phone Contact, AB: Abstract*

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