SINGLE POT GREEN SYNTHESIS, CHARACTERIZATION AND ANTIMICROBIAL STUDIES OF SILVER NANOPARTICLES USING TROPICAL MEDICINAL PLANT EXTRACTS

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STUDENT'S CERTIFICATION

I, OKONKWO, Chidiogo Rita certify that this Thesis: SINGLE POT GREEN SYNTHESIS, CHARACTERIZATION AND ANTIMICROBIAL STUDIES OF SILVER NANOPARTICLES USING TROPICAL MEDICINAL PLANT EXTRACTS (*Tithonia diversifolia* and *Acalypha wilkesiana*) is the original research carried out by me which has never been replicated for the Degree of Bachelor of Science (B.Sc) in any University.

…… **……**

STUDENT'S NAME **SIGNATURE AND DATE**

CERTIFICATION

This work has been read and approved as meeting the requirement for the award of B.Sc (Hons) Degree in Industrial Chemistry Program, Department of Physical Sciences, College of Science and Engineering, Landmark University, Omu-Aran, Kwara State, Nigeria.

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DEDICATION

I dedicate this study to God Almighty, whom by His grace, made this study a possibility, also to my parents, Mr and Mrs Emmanuel Okonkwo, for always striving hard to get the best for me and their constant support and all the Lecturers of Industrial Chemistry, Landmark University, whose support and mentorship brought me this far in academics.

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God bless you all abundantly.

ABSTRACT

Research on the single pot green synthesis of silver nanoparticles (AgNPs) was done using aqueous medicinal plant extract of *Tithonia diversifolia* and *Acalypha wilkesiana.* Characterization was carried out by spectroscopic techniques. Experimental optimization studies and the antimicrobial activity of the nanoparticles were investigated. Bottom-up approach was applied for the synthesis of both *Tithonia diversifolia* silver nanoparticles (TD-AgNPs) and *Acalypha wilkesia* silver nanoparticles (AW-AgNPs) using silver nitrate ($AgNO_3$) and the leaf extract from these tropical medicinal plants. UV-Vis spectroscopy was done to monitor the growth of nanoparticles and measure the Surface Plasmon Resonance (SPR) of the synthesized silver nanoparticles. The scan was taken within the range of 200-800nm for both TD-AgNPs and AW-AgNPs respectively. SPR peaks for both TD-AgNPs and AW-AgNPs were between the range the range of 425-465nm. Phytochemical screening confirmed the presence of saponins, steroids, flavonoids, alkaloids and triterpenes for *T.*diversifolia and saponins, flavonoids, phenols and triterpenes for *A.*wilkesiana. These phytomolecules are responsible the capping and stabilization of silver nanoparticles. Fourier Transform Infrared (FTIR) Spectroscopy confirmed the presence of functional groups responsible for bioreduction of Ag^+. Scanning Electron Microscopy (SEM) revealed the surface morphology of AgNPs. Optimization of various parameters for the synthesis was carried out under these studies vis-à-vis effect of concentration, contact time, volume ratio, pH and temperature. Contact time of 90 minutes was observed as the optimal reaction time for the synthesized nanoparticles to attain completion, concentration of 0.001 M and 0.01 M $AgNO_3$, pH 9, and volume ratio 1:9 for both TD-AgNPs and AW-AgNPswere more effective in the generation of the nanoparticles. Optimal temperature of 323 K favoured rapid formation of both TD-AgNPs and AW-AgNPs and this confirmed that with the higher the temperature, the faster AgNPs formation. FTIR Antimicrobial studies of TD-AgNPs and AW-AgNPs was carried out against *Staphylococcus aureus, Escherichia coli, Aspergillus flavus* and this study showed that TD-AgNPs and AW-AgNPs were active against these bacteria and fungus with the zona of inhibition ranging between 8mm to 11 mm. This environmental friendly approach provides easy, simple and cost effective faster synthesis of nanoparticles than chemical methods and this can find application in medicine and food.

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