residual powder with hydrosol (1:4), was added to $AgNO_3$ (1mM, 10 ml) for fabricating AgNPs. The effect of the key factors governing the synthesis of AgNPs, including CDW volume (0.1, 0.2, 0.5, 1, 2.5, 5 ml), concentration of AgNO3 (0.25, 0.50, 0.75, 1, 1.25 mM), temperature (25, 40, 60, 80 °C), reaction pH (3.0, 5.0, 7.0, 9.0, 11.0) and time (15, 30, 60, 120 min) were optimized. AgNPs were characterized by UV-Vis spectroscopy, TEM-EDS, and XRD. Antibacterial activity was determined by agar well diffusion and spot assays. Cinnamaldehyde (79.92%), cinnamyl acetate (2.80%), and eugenol (7.50%) were identified by GC-MS as the major components in trapped oil in hydrosol, and the total polyphenolic content of the residual was 560.58± 9.49 mg, which confirmed that the chemical constitutes in CDW may act as reducing, capping and stabilizing agents in NPs synthesis. Production of AgNPs was initially confirmed by λ_{max} at 402 nm in the UV-Vis spectrum, characteristic for metallic silver. XRD analysis revealed the crystalline nature, and presence of elemental silver (3 keV) was confirmed by EDS. The presence of spherical nanoparticles of 56.73 nm average size with moderate stability (-29.5 mV) and monodispersity (PDI 0.441) were confirmed by TEM and DLS analysis. According to the ICP-MS analysis, the highest conversion of 99.8% was obtained when the AgNPs synthesis was performed at 1 mM silver nitrate: CDW 10:0.2, pH 11, 80 °C, 2 h, and the particles were stable over a 4-month period. The minimum growth inhibitory concentrations for Gram-positive *S. aureus* and Gram-negative *E. coli* were 30 µg/ml (5.00±0.00 mm) and 70 µg/ml (6.67±0.58 mm), respectively. In conclusion, AgNPs synthesized using Cinnamomum zeylanicum Blume post distillation waste can be introduced as a potential antibacterial agent for Gram-positive and Gram-negative bacteria.

Keywords: *Cinnamomum zeylanicum*, Cinnamon distillation waste, silver nanoparticles, anti-bacterial

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Feasibility study of ^{64}Cu production using neutron activation for potential application in Positron Emission Tomography (PET) in Sri Lanka

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Among various medical imaging techniques, Positron Emission Tomography (PET) is increasingly being used in medical diagnosis. However, PET scanning is quite expensive owing to the difficulties in manufacturing radioactive tracer. Isotopes used in PET medical diagnosis are commonly produced using nuclear reactions with proton beams generated in cyclotrons and neutron flux from reactors. PET isotopes are not readily available in underdeveloped countries such as Sri Lanka due to high production cost. It is worthwhile to utilize low-cost approach using thermal Neutron Activation (NA). The present study was aimed to produce Copper-64 (^{64}Cu) PET isotope using NA method, which is available in Sri Lanka. Natural copper sulphate sample was irradiated to produce ^{64}Cu. In addition to the desired isotope, ^{66}Cu is produced as a contaminant due to NA of naturally occurring ^{65}Cu. Activity of ^{64}Cu was studied as a function of sample activation time, sample size, and cooling time to optimize ^{64}Cu yield and minimize contaminants. Production properties of ^{64}Cu such as neutron flux and half-life have been measured as a part of optimization and identification. The best specific activities of ^{64}Cu and ^{66}Cu are 139.8 ± 12.85 Bq g-1 and 17.4 ± 7.23 Bq g-1, respectively, using 241Am/Be neutron source in the University of Colombo. Activity values show that there is a potential of producing the ^{64}Cu radioisotope from the ^{63}Cu isotope under the optimal conditions using the thermal neutron activation. Further development of this technique requires isotope separation in large scales. The study revealed the ^{64}Cu isotope produced using NA method can be used in laboratory trials.

Keywords: PET, NA,^{64}Cu, ^{65}Cu, ^{66}Cu