Abstract No: TS 11

Characterization of BSA nanoparticles loaded with bioactive compounds present in the quills of *C. zeylanicum* as an antidiabetic nutraceutical

B. S. Wanniarachchi, H. M. W. K. Sathsarani and B. M. Jayawardena*

Department of Chemistry, University of Kelaniya, Sri Lanka

**Corresponding author: bimali@kln.ac.lk*

Diabetes mellitus is the most common non-communicable disease and the ninth leading cause of death in the world. Oral antidiabetic drugs have serious side effects and therefore, about 60% of the world's population currently uses traditional medicine in the treatment of diabetes as the side effects are less. The antidiabetic properties of cinnamon including the inhibition of pancreatic enzymes, stimulation of cellular glucose uptake by GLUT-4 and stimulation of insulin release, make it suitable for use in the development of an antidiabetic nutraceutical. *Cinnamomum zeylanicum* "Sri Vijaya" (CCSV) accession contains high amounts of antidiabetic compounds and an aqueous extract of its quills can be prepared using the pressurized water extraction method, which has proven to show higher activity than other extraction methods. Nanoparticles synthesized using Bovine Serum Albumin (BSA) are less toxic, non-antigenic, biodegradable, biocompatible and easy to produce. The objective of the present study was to characterize cinnamon loaded nanoparticles using parameters such as particle size, surface charge, morphology, and particle structure using FTIR and cinnamon entrapment using UV-visible spectrophotometry. Nanoparticles were synthesized using BSA solution (20 mg/mL, 4 mL, pH 9), aqueous extract of quills of CCSV (4 mL), ethanol as the desolvation agent and citric acid as the cross-linking agent. Cinnamon encapsulated BSA nanoparticles were obtained 1281 ± 4.5 nm in size, with a polydispersity index of 0.460 ± 0.018 and zeta potential value of -1.09 ± 0.03 mV at the optimum point of the desolvation process. The obtained SEM images showed that the synthesized nanoparticles have a spherical morphology. The FTIR results showed that the cross-linking agent, citric acid has caused confirmational changes in the protein structure of BSA during nanoparticle formation, while the UV-visible spectrum indicated that the active compounds of the aqueous cinnamon extract have been successfully loaded into the BSA nanoparticles.

Keywords: Diabetes mellitus, Cinnamon, BSA nanoparticles, Desolvation, Citric acid

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Cinnamomum zeylanicum Blume post distillation waste mediated fabrication of silver nanoparticles and evaluation of their antibacterial activities

C. M. Lokuge[1], P. Ranasinghe[2], H. D. Weerathunge[2], G. A. S. Premakumara[3] and H. I. C. De Silva[1]*

[1] Department of Chemistry, University of Colombo, Kumaratunga Munidasa Mawatha, Colombo 03, Sri Lanka

[2] Herbal Technology Section, Modern Research and Development Complex, Industrial Technology Institute, Malabe, Sri Lanka

[3] Department of Basic Science & Social Science, Faculty of Nursing, University of Colombo, Sri Jayewardenapura, Thalapathpitiya, Nugegoda, Sri Lanka

**Corresponding author: hicdesilva@chem.cmb.ac.lk*

Residuals and unrecovered oils, including hydrosols, enriched in phenolic compounds are discarded as waste during the cinnamon bark oil extraction process in Sri Lanka. The objective of this research was to synthesize silver nanoparticles (AgNPs) by exploiting cinnamon-distillation waste (CDW) and study their antibacterial activity for use in cosmetic formulations. CDW (0.2 ml), prepared by mixing aqueous extract of cinnamon

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

Abstract No: TS 41

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

E. G. M. Dilukshi[1], C. S. Sumithrarachchi[2] and M. R. Lamabadusuriya[1]*

[1] *Department of Nuclear Science, Faculty of Science, University of Colombo, Colombo 00300, Sri Lanka*

[2] *Michigan State University, East Lansing, Michigan, USA*

**Corresponding author: manuja.lama@nuclear.cmb.ac.lk*

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