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Anti-diabetic activity of cinnamon (*Cinnamomum zeylanicum*) loaded nano-particles

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Ceylon cinnamon (*Cinnamomum zeylanicum*) is one of the cinnamon species that shows relatively high anti-diabetic activity. “Sri Vijaya” cinnamon variety (CCSV) is an accession of *C. zeylanicum* and, it has been identified as a good source of anti-diabetic compounds. The aqueous extract of the quills of CCSV is rich with anti-diabetic compounds. Mainly there are two methods that are used to prepare the aqueous extract. One method is “pressured water extraction” and the other is “decoction”. According to the previously conducted researches, the aqueous extract which is prepared using “pressured water extraction” is more active than the other. Higher stability and the easiness of storage and transportation make powdered drugs and nutraceuticals preferred over liquids. However, most of the powdering techniques such as freeze drying and spray drying decrease the activity of the aqueous extracts. The objective of the present study was to synthesize a powdered nutraceutical from the pressured water extract of the quills of CCSV while conserving the anti-diabetic properties. In this study, cinnamon loaded nano-particles were synthesized using bovine serum albumin (BSA) as the base and citric acid as the cross-linking agent. Since nano-particles are extremely small in size, their surface area is higher. Because of that their reactivity is also higher compared with the other powdered form of drugs and nutraceuticals. α -amylase inhibitory activity and the α -glucosidase inhibitory activity of nano-particles were determined using dinitrosalicylic acid assay and para nitrophenyl glucopyranoside assay respectively and the corresponding IC₅₀ values were calculated using Graphpad prism software in order to assess the anti-diabetic properties. The inhibitory activity and IC₅₀ values of the aqueous cinnamon extract and the positive control acarbose were determined using the same enzyme assays and they were compared with the values obtained for nano-particles. The obtained data were statistically analysed by one-way analysis of variance (ANOVA) using SPSS software package. The IC₅₀ values of nano-particles, aqueous cinnamon extract and acarbose on α -amylase were $117.60 \pm 1.73 \mu\text{g/mL}$, $131.27 \pm 1.64 \mu\text{g/mL}$ and $140.37 \pm 1.17 \mu\text{g/mL}$ respectively. The IC₅₀ values of the same compounds on α -glucosidase were $119.25 \pm 0.07 \mu\text{g/mL}$, $141.25 \pm 0.21 \mu\text{g/mL}$ and $224.45 \pm 0.21 \mu\text{g/mL}$ respectively. IC₅₀ values obtained for nano-particles showed statistically significant difference compared to others. In conclusion, cinnamon loaded nano-particles showed higher inhibitory activity on α -amylase and α -glucosidase than the aqueous extract and acarbose.

Keywords: Ceylon cinnamon, Diabetes, Nano-particles, Nutraceuticals

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