

ORIGINAL CONTRIBUTION

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Root extracts of *Anacardium occidentale* reduce hyperglycemia and oxidative stress *in vitro*

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Abstract

Background: Hyperglycemia is the hallmark of diabetes, and the associated oxidative stress is a major concern that invites an array of diabetic complications. The traditional practices of medicare are of great, current interest due to the high cost and side effects of conventional diabetic medications. The present *in vitro* study focuses on evaluating the potential of various *A. occidentale* root extracts for their antihyperglycemic and antioxidant potentials.

Materials and methods: The four different solvent extracts petroleum ether (PEAO), chloroform (CHAO), ethyl acetate (EAAO), and 80 % methanol (80 % MAO) of *A. occidentale* roots were evaluated for their total phenolic, flavonoid, and antioxidant capacity. Using MIN6 pancreatic β -cells, the cytotoxicity of the extracts was evaluated by MTT assay and the antidiabetic potential by quantifying the insulin levels by ELISA at a higher concentration of glucose. The effect of 80 % MAO on *INS* gene expression was determined by qRT PCR analysis.

Results: Among the four different solvent extracts of *A. occidentale* roots, 80 % MAO showed the highest concentration of phenolics ($437.33 \pm 0.03 \mu\text{g GAE/mg}$), CHAO to be a rich source of flavonoids ($46.04 \pm 0.1 \mu\text{g QE/mg}$) and with the highest total antioxidant capacity ($1865.33 \pm 0.09 \mu\text{g AAE/mg}$). Evaluation of the free radical scavenging and reducing properties of the extracts indicated 80 % MAO to exhibit the highest activity. The MTT assay revealed the least cytotoxicity of all four extracts. 80 % MAO enhanced *INS* up-regulation as well as insulin secretion even under high glucose concentration (27mM).

Conclusions: The present study demonstrated that the *A. occidentale* root extracts have effective antihyperglycemic and antioxidative properties, together with the potential of normalizing the insulin secretory system of β -cells. Above mentioned properties have to be studied further by identifying the active principles of *A. occidentale* root extracts and *in vivo* effects. The prospect of the present study is identifying drug leads for better management of diabetes from the *A. occidentale* root extracts.

Keywords: *Anacardium occidentale*, Pancreatic β -cells, *INS* gene, High glucose-induced oxidative stress, qRT PCR

Introduction

A coordinated interaction of the physiological processes – Insulin secretion, glucose uptake by peripheral tissues, and hepatic glucose production is known to maintain glucose homeostasis in the body. Inadequacy in the maintenance of glucose homeostasis results in the chronic elevation of blood

glucose levels [1]. Hyperglycemia, the forerunner and consistent marker of all types of diabetes and the concerning factor of diabetic complications has now become a challenge to the health systems. Hyperglycemia is often the result of insufficient secretion of insulin or its resistance which when prolonged results in microvascular and macrovascular complications [2]. The high glucose levels lead to altered metabolism, free radical generation, and induce apoptosis in β -cells and other cell types [3]. According to Robertson et al.'s perspectives, prolonged glucotoxicity is known to cause

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