



Preparation, optimization and biological evaluation of gymnemic acid loaded niosomes against streptozotocin-nicotinamide induced diabetic-nephropathy in Wistar rats

Tinku Singhal^a, Mohd. Mujeeb^{a,*}, Abdul Ahad^b, Mohd. Aqil^{c,**}, Syed Obaidur Rahman^d, Abul Kalam Najmi^d, Waseem Ahmad Siddiqui^e

^aDepartment of Pharmacognosy & Phytochemistry, School of Pharmaceutical Education and Research, Jamia Hamdard (Deemed University), M. B. Road, New Delhi, 110062, India

^bDepartment of Pharmaceutics, College of Pharmacy, King Saud University, P.O. Box 2457, Riyadh, 11451, Saudi Arabia

^cDepartment of Pharmaceutics, School of Pharmaceutical Education and Research, Jamia Hamdard (Deemed University), M. B. Road, New Delhi, 110062, India

^dDepartment of Pharmacology, School of Pharmaceutical Education & Research, Jamia Hamdard (Deemed University), New Delhi, 110062, India

^eInterdisciplinary Biotechnology Unit, Aligarh Muslim University, Aligarh, 202001, India



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ABSTRACT

The present study was designed to develop and evaluate the gymnemic acid (GA)-loaded niosomes against “streptozotocin-nicotinamide” (STZ-NA) induced “diabetic nephropathy” (DN) in Wistar rats.

GA-loaded niosomes were formulated using the “thin-film hydration” process. Various preparations were prepared as per the “Box-Behnken design” and screened for vesicles size, zeta-potential and entrapment efficiency. Furthermore, the best final niosomes formulation was evaluated for their efficacy in controlling the DN potential in a STZ-NA induced diabetic Wistar rats. Further various biochemical tests were performed using commercially available “kits of Genx-bio health science Pvt. Ltd”.

The optimized GA-loaded niosomes demonstrated vesicles size of 138.8 nm with zeta potential and entrapment efficiency of 76.9 mV and 87.5%, respectively. Administration of STZ-NA in normal rats showed significant ($P < 0.001$) changes in animals body weight, blood glucose level (BGL) and in lipid profile [“total cholesterol (TC), triglyceride (TG), high-density lipoprotein (HDL), low-density lipoprotein (LDL), and very-low-density lipoprotein (VLDL)”] as well as antioxidant level indicating DN symptoms.

Animals treated with GA-loaded niosomes formulation substantially decreased antioxidant level, lipid levels. Furthermore, GA-loaded niosomes significantly reduced “pro-inflammatory cytokines viz. interleukin (IL-6), tissue necrosis factor (TNF- α) and fibronectin” levels. The present study concluded the advantages of GA-loaded niosomes and explains the effectiveness of prepared formulation in controlling serum antioxidant, lipid profile and diabetic complications in experimentally induced DN in animals via inhibiting of oxidative stress and “advanced glycation end products (AGE’s)”.

1. Introduction

Diabetes mellitus is one of the most leading diseases globally with the most prominent figures of patients in India. It is described by the marred insulin secretion by the “Islet of Langerhans” of the pancreas. This upsurges the “blood glucose level (BGL)” and which consecutively causes impairments of tissues and organs in the chronic stage.

Chronic diabetes results in prolonged hyperglycemia which

consecutively contributes to dangerous diabetic complexities for instance “retinopathy, neuropathy, nephropathy, cardiovascular problems, liver disease, and limb amputation” [1]. Diabetic nephropathy (DN) is one of the primary reasons for other disease and deaths for around 40% diabetic cases [2].

Conventional medicines gained primarily from plant life contributes a key role in the controlling of diabetes mellitus [3]. “World health organization” has endorsed the usage of medicinal plants for the

* Corresponding author. Department of Pharmacognosy and Phytochemistry, School of Pharmaceutical Education and Research, Jamia Hamdard (Deemed University), New Delhi, 110062, India.

** Corresponding author.

E-mail addresses: mohdmujeeb72@gmail.com (M. Mujeeb), abdulahad20@yahoo.com, aahad@ksu.edu.sa (A. Ahad), aqilmalik@yahoo.com (M. Aqil).

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