## Antioxidant and Antidiabetic Activities of Terminalia Chebula Fruit on Induced Diabetes in Rats

#### **Thesis**

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# Submitted by

Monira Mohamed Mostafa El Refaey

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# Under Supervision of

Prof. Dr. Shadia Abdel Hamid Fathy Prof. Dr. Fatma Farag Abdel Hamid

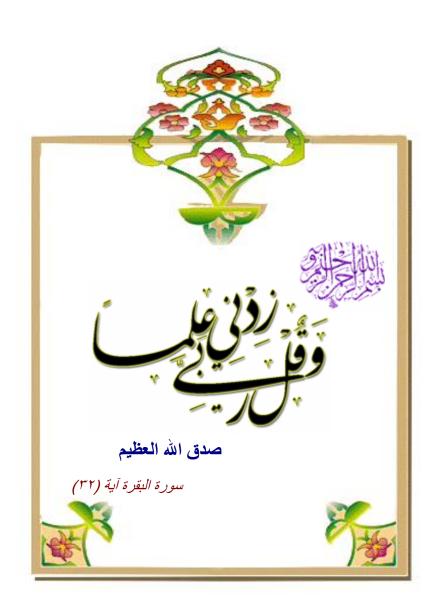
Professor of Biochemistry Faculty of Science Ain Shams University Professor of Biochemistry
Faculty of Science
Ain Shams University

Dr. Osama Ahmed Abbas Lecturer of Biochemistry Nuclear Research Center (NRC) Atomic Energy Authority (AEA) Dr. Asrar Mohamed Hawas
Lecturer of Physiology
National centre for Radiation Research&
Technology
Atomic Energy Authority (AEA)

I declare that this thesis has been composed by myself and the work which is recorded has been done by myself.

It hasn't been submitted for a degree at this or this in other university.

**Monira Mohamed Mostafa El Refaey** 





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CA

#### LIST OF ABBREVIATIONS

 $\begin{array}{lll} -\text{epi-PGF} & & -\text{epi-piostaglandin F}_{-\alpha} \\ \text{AFI} & & \text{Ayurvedic formulary of India} \\ \text{AGE} & & \text{Advanced glycation end products} \\ \end{array}$ 

ALT(GPT) Alanine aminotransferase
AMP Adenosine monophosphate
AST(GOT) Aspartate aminotrasferase
ATP Adenosine triphosphate
BMI Body mass indices
BW Body weight

CD Cluster of differentiation antigen number

Chebulic acid

CMV Cytomegalo virus Co-A Co-enzyme A

CTL Cytotoxic-T-Lymphocytes

Cu Copper Cu<sup>++</sup> Copper ion

DDT Dichloro-diphenyl-trichloro-ethane

DM Diabetes mellitus
DMT- Diabetes mellitus typeDNA Deoxyribonucleic acid
DPP- Dipeptidyl peptidase -

DTH Delayed type hypersensitivity
DTNB dithiobis - nitrobenzoic acid

Ec Extracellular

ESR Electron spin resonance technique

FRC Free radical capacity

GA Gallic acid

GCLC γ-Glutamytcystiene ligase

GK Goto-Kakizaki

GLP- Glucagon – like peptide
GLUT- Glucose transporter type
GPX Glutathione peroxidase
GRD Glutathione reductase

GSH Glutathione

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GSSG Glutathione disulphide
GST Glutathione – S – transferase

HO Hydrogen peroxide
HA Humoral antibody
Hb Hemoglobin

HbA C(A C) Glycosylated haemoglobin

HCB Hexachlorobenzene
HDL High density lipoprotein

HEK-N/F Human embryonic kidney nuclear factor

HIV Human immunodeficiency virus

Ho<sup>-</sup> Hydroxyl radical Hoo<sup>-</sup> Perhydroxy radical HSV Herpes simplex virus

IDDM Insulin- dependent diabetes mellitus

IGT Impaired glucose tolerance

INH Isoniazid

IR Insulin resistance
JNK Jun N. Terminal kinase
LDL low density lipoprotein
LPS Lipid peroxide levels

MALA Metformin-associated lactic acidosis MBC Minimum bactericidal concentration

MDA Malondialdehyde MF Metformin

MIC Minimum inhibitory concentration

Mn Manganese

mRNA Messenger ribonucleic acid

NAC N – acetyl cystiene

NAD Nicotinamide adenine dinucleotide

NAD<sup>+</sup> Reduced form of nicotinamide adenine dinucleotide NADP Nicotinamide adenine dinucleotide phosphate

NADP<sup>+</sup> Reduced form of nicotinamide adenine dinucleotide

phosphate

NADPH Nicotinamide adenine dinucleotide phosphate
NIDDM Non-insulin dependent diabetes mellitus
NPH Neutral protamine hagedorn insulin

O Oxygen molecule

#### List of Tables

O Superoxide anion
OADS Oral antidiabetic drugs
OS Oxygen species

PBS Phosphate buffered saline PCBS Polychlorinated biphenyls

PCDDS Polychlorinated dibenzo-p-dioxins PCDFS Polychlorinated dibenzo furans

PDX- Pancreatic and duodenal homeobox gene

POPS Persistent organic pollutants

PZA Pyrazinamide RBCs Red blood cells RIF Rifampicin

RNS Reactive nitrogen species
ROS Reactive oxygen species
SOD Superoxide dismutase

STF- Somatostatin transcription factor

T.chebula Terminalia chebula

T DM Type- - diabetes mellitus
T DM Type- - diabetes mellitus
TAE Terminalia aqueous extract

TBARs Thiobarbituric acid reactive substance

T-BHP Tert – butyl hydroperoxide t-BHP Tert-butyl hydroperoxide

TCA Trichloroacetic acid
TFR Total free radical

TNF  $\alpha$  Tumer necrosis factor  $\alpha$ 

TRAP Total peroxyl radical trapping potential

TRFs Terminal restriction fragments

UCCMA United Company for Chemicals and Medical

preparation

UVB Ultra violet B

VLDL Very low density lipoprotein Vo max Maximal oxygen consumption

ZDF Zucker diabetic fatty rat

Zn Zinc

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### **ABSTRACT**

The field of herbal medicines research has been gaining significant importance in the last few decades and the demand to use natural products in the treatment of diabetes is increasing worldwide. **Terminalia chebula** is a traditional medicine belonging to the genus Terminalia, family Combretaceae. Fruits of Terminalia chebula (T.chebula) are known for their antidiabic properties to control the hyperglycemia. In the present study, the aqueous and ethanolic extracts of the fruits of *T.chebula* were tested for its hypoglycemic activity after oral administration in alloxan-induced diabetic male albino rats. Moreover, the extracts were also evaluated for their hepatoprotective, renoprotective, hypolipidemic activity, insulin secretion effects up and the antioxidant status on the study of diabetic rats. Malondialdehyde (MDA) as indicator to lipid peroxidation process, glutathione (GSH) level and superoxide dismutase (SOD) activity were measured in rat liver. Free radical capacity (FRC) and glucose levels were determined in blood samples. The effects of metformin treatment only and in combination with the aqueous extract of T.chebula were also studied.

It was evident that treatment of alloxan-induced diabetic rats with aqueous extract of *T.chebula*, metformin and metformin plus aqueous extract of *T.chebula* resulted in a highly significant reduction of glucose level when compared to untreated diabetic group. This was confirmed with the effect of the above treatment on