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Potential Ameliorative Effect of the Red Sandalwood (*Pterocarpus santalinus*) against Streptozotocin induced Diabetes Mellitus in Adult Male Rats

A Thesis

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Dedication

To my beloved mother

To my beloved father

To my dear brother

Mr. Mohammed

To my sisters

To my beloved wife

To

Dr. Manal A. Hashim

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Dr. Gada M. EL-Sadek

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Dr. Dalia Mamdouh

Mr. Waleed Hosny

Mrs. Nohaa Sayed

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List of abbreviations

<u>Abbrev.</u>	<u>Full term</u>
4-AAP	4- Aminoantipyrine
AD	Alzheimer's disease
ADP	Adenosine diphosphate
AIDS	Acquired immune deficiency syndrome
ALT	Alanine aminotransferase
ANOVA	One-way analysis of variance
AP-1	Activator protein 1
ASHG	α -Heremans-schmid glycoprotein
AST	Aspartate aminotransferase
CHE	Cholesterol esterase
CHO	Cholesterol oxidase
CKD	Chronic kidney disease
CNS	Central nervous system
CVD	Cardiovascular disease
DEPC	Diethylpyrocarbonate
DM	Diabetes mellitus
DN	Diabetic nephropathy
EDTA	Ethylene diamine tetra acetate
ELISA	Enzyme linked immune sorbent assay
FBG	Fasting plasma glucose
F-DAOS	N-Ethyl-N-(2-hydroxy-3-sulfopropyl)- 3.5-dimethoxy-4 fluoroaniline
FFAs	Free fatty acids

List of abbreviations, *cont.*,

G.6.PDH	Glucose-6-phosphate dehydrogenase
GDM	Gestational diabetes mellitus
eGFR	estimated Glomerular filtration rate
GK	Glycerol kinase
GLDH	Glutamate dehydrogenase
GLUT	Glucose transporter
GPO	Glycerol phosphate oxidase
Grb2	Growth factor receptor-bound protein 2
HbA1c	Glycated hemoglobin
HCCs	Hepato-cellular carcinomas
HDL-chol.	High density lipoprotein-cholesterol
HK	Hexokinase
HMMPS	N-(3-sulfopropyl)-3-methoxy-5-methylaniline
HOMA-IR	Homeostatic model assessment insulin resistance
HPL	High performance liquid chromatography
IDDM	Insulin dependent diabetes mellitus
IDF	International diabetes federation
IFCC	International Federation for Clinical Chemistry
IFG	Impaired fasting glucose
IGF-1	Insulin like growth factor-1

List of abbreviations, *cont.*,

IGT	Impaired glucose tolerance
i.p	Intraperitoneally
IR	Insulin resistance
IRS	Insulin receptor substrate
JNK	c-Jun N-terminal kinase
LDH	Lactate dehydrogenase
LDL-chol.	Low density lipoprotein-cholesterol
MDH	Malate dehydrogenase
MS	Multiple sclerosis
NAD ⁺	Nicotinamide adenine dinucleotide (oxidized)
NADH	Nicotinamide adenine dinucleotide (reduced)
NAFLD	Non alcoholic fatty liver disease
NASH	Non-alcoholic steatohepatitis
NF-kB	Nuclear factor kappa-B
NIDDM	Non- insulin dependent diabetes mellitus
•NO	Nitric oxide
eNOS	endothelial Nitric oxide synthase
OGTT	Oral glucose tolerance test
p38 MAPK	p38 mitogen-activated protein kinase

List of abbreviations, *cont.*,

p53	Tumor protein p53
p85	Regulatory subunit of PI3K
PARP-1	Poly-ADP-ribose Polymerase-1
PGC-1	peroxisome proliferator-activated receptor co-activator 1
PI3K	Phosphatidylinositol 3-kinase
PIP2	Phosphatidylinositol biphosphate
PIP3	Phosphatidylinositol 3,4,5-triphosphate
PKC	Protein kinase C
POD	Peroxidase
PPAR- γ	Peroxisome proliferative activated receptor- γ
PPRE	Peroxisome proliferative response elements
PTB	Phosphotyrosine binding domain
qPCR	Quantitative polymerase chain reaction
ROS	Reactive oxygen species
RXR	Retinoid X receptor
SH2	Src-homology-2
SIRT1	Silent information regulator-1
SNPs	Single nucleotide polymorphisms
STZ	Streptozotocin
T1DM	Type one diabetes mellitus
T2DM	Type two diabetes mellitus

List of abbreviations, *cont.*,

TAGs	Triacylglycerols
T-chol.	Total cholesterol
TTAB	Tetradecyl trimethyl ammonium bromide
VLDL-chol.	Very low density lipoprotein-cholesterol

Table 4.5: Effect of aqueous extract of *Pterocarpus santalinus* and STZ on serum total cholesterol (T-chol.), triacylglycerols (TAGs), high density lipoprotein cholesterol (HDL-chol.), low density lipoprotein cholesterol (LDL-chol.) and very low density lipoprotein cholesterol (VLDL).

Groups	T.chol. (mg/dl)	TAGs (mg/dl)	HDL-chol. (mg/dl)	LDL-chol. (mg/dl)	VLDL(mg/dl) (TAGs/5)
Control	73.60±6.39	105.20±19.53	24.40±2.46	28.16±7.57	21.04±3.89
Extract	75.00±6.90	98.00±13.71	27.17±1.77	28.23±6.55	19.60±2.75
STZ1	84.00±6.15	96.00±12.47	23.50±2.12	41.30±4.65	19.20±2.49
STZ1+Extract	71.17±3.49	86.83±7.51	23.83±1.01	29.98±2.79	17.36±1.50
STZ1+Glustin	90.50±4.28	121.33±11.45	50.17±3.16 ^b	16.07±3.63 ^b	24.26±2.29
STZ2	80.33±3.15	97.33±11.49	26.33±1.72	34.54±4.07	19.46±2.29
Extract+STZ2	61.67±5.20	128.00±22.33	25.67±2.01	10.40±1.68 ^c	25.60±4.46

^b: indicates a significant difference ($p < 0.05$) from STZ1 group.

^c: indicates a significant difference ($p < 0.05$) from STZ2 group.

Statistical analysis was performed by one way ANOVA followed by Tukey-Kramer post test, $n = 6$

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