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Faculty of Science  
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# **Assessment of the effects of some commercial antiaging supplements on aging biomarkers in liver of male rats**

**A thesis**

*Submitted as a partial fulfillment for requirements of the  
master's degree in biochemistry*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ  
وَعَلَّمَكَ اللَّهُ الْكِتَابَ  
وَكَأَن فَضْلَ اللَّهِ عَلَيْكَ عَظِيمٌ

(سورة النساء- 113)



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## *Declaration*

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

*Ameera saeed ahmed alshinnawy*

## *Dedication*

*To*

### *My Mother*

*A strong and gentle soul who taught me to trust in Allah, believe in hard work and that so much could be done with little*

### *My Father*

*For earning an honest living for us and for supporting and encouraging me to believe in myself*

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## *List of Abbreviations*

4-AAP: 4-amino-antipyrine
AIF: apoptosis-inducing factor
ALT: alanine aminotransferase
ANOVA: Analysis of Variance
ATM: Ataxia telangiectasia mutated (Serine/Threonine Kinase
ATP: adenosine triphosphate
BAD: BCL-2- associated agonist of cell death
BAX: BCL-2-associated X
CAT: catalase
cDNA: complementary deoxyribonucleic acid
CDNB: 1-chloro-2, 4-dinitrobenzene
CHK2: checkpoint kinase
CYP: cytochrome P450
cyp3a1: cytochrome 3a1
DAB: 3,3-diaminobenzidine
DCHB: 3,5-dichloro-2-hydroxybenzene sulfonic acid
DEPC: diethylpyrocarbonate
DNA-PK: DNA-dependent protein kinase
EDTA: ethylenediaminetetraacetic acid
ER: endoplasmic reticulum
FSH: follicle stimulating hormone
GAPDH: glyceraldehyde phosphate dehydrogenase
GFR: glomerular filtration rate
GH: growth hormone
GnRH: gonadotropin releasing hormone
GS-DNB: glutathione-2,4-dinitrobenzene
GSH-Px: glutathione peroxidase
GST: glutathione S-transferase

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H&E: hematoxylin and Eosin
HRP: horseradish peroxidase
IGF-1: insulin-like growth factor-1
IIS: the insulin and IGF-1 signaling
JNK: c-Jun N-terminal kinase
LH: luteinizing hormone
MAPK: mitogen-activated protein kinase
MDA: malondialdehyde
Mdm2: mouse double minute 2
NADPH: nicotinamide adenine dinucleotide phosphate
NaOH: sodium hydroxide
NF-κB: nuclear factor kappa B
NHTMRI: National Hepatology and Tropical Medicine Research Institute
NRF2: nuclear factor E2-related factor-2
p 21: cyclin-dependent kinase inhibitor 1 or CDK-interacting protein 1
p53: tumour suppressor protein
PBS: phosphate-buffered saline
PGC-1α/β: gamma coactivator 1 alpha and beta
PPARs: peroxisome proliferator-activated receptors
PTE: proximal tubular epithelium
PUMA: p53 upregulated modulator of apoptosis
PXR: pregnane X receptor
RNA: ribonucleic acid
RNS: reactive nitrogen species
ROS: reactive oxygen species
SDS: sodium dodecyl sulphate
SIRT1: sirtuin 1, SERCA: sarcoendoplasmic reticulum calcium transport ATPase

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SMP30: anti-apoptotic senescence marker protein 30, CHOP: C/EBP homologous protein.
SOD: superoxide dismutase
src: proto pncogene non reseptror tyrosin kinase.
Ta-65: telomerase activator-65
TEM: transmitted electron microscopy
TERC: RNA containing a template site for DNA elongation
Tert: telomerase reverse transcriptase
TMB: tetramethyl benzidine
TPB: tetraphenylborate
TRF2: telomeric repeat-binding factor 2
TrxR1: thioredoxin reductase1