



بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / مني مغربي أحمد

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى

مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد





جامعة الإسكندرية
ALEXANDRIA
UNIVERSITY

**Faculty of Specific Education
Home Economics Department
(Food and Nutrition Sciences)**

**The potential protective role of pomegranate molasses against
biochemical changes induced by doxorubicin in male rats**

**A thesis submitted in partial fulfillment of the requirements for
the degree of Doctor in Philosophy Specific Education**

In

**Home Economics
(Food and Nutrition Sciences)
Presented by**

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Declaration

I hereby declare that no part of this dissertation has been submitted to Alexandria University or to any other University in Egypt or abroad as part of the requirements to obtain another degree. Furthermore, Alexandria University code of ethics and rules of academic integrity have been followed.

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ACKNOWLEDGEMENT

First of all, I wish to express my deepest gratitude and thanks to Allah, the beneficent, the merciful, who gave me magnificent help and power to accomplish this work, facilitated every difficult steps and gave me the patience and power to face every difficulty in my life and during this work. The generous supervisors are considered one of the important gifts from my Lord to me.

I would like to express my great appreciation to **Professor Dr. Mokhtar Ibrahim Yousef**, Former Vice President of Graduate Studies and Research, Alexandria University, Professor of Environmental Animal Physiology and Reproductive Toxicology, Department of Environmental Studies, Institute of Graduate Studies and Research, Alexandria University, for the suggestion of the research subject and the ideas, also, for his close supervision during the experimental work and for devoting much of his time and effort in the supervision of the thesis, for his guidance, generosity, spirit, encouragement and fruitful criticism during the preparation of the manuscript.

I would like to express my sincere thanks to **Professor Dr. Malak Mahmoud Reda**, Professor of Nutrition Sciences, Department of Home Economics, Faculty of Specific Education, Alexandria University, for her great support, guidance, supervision and advice throughout the study and her encouragement during the preparation of the manuscript.

Also, I would like to express my sincere thanks to **Professor Dr. Ebetsam Fath Mahmoud Omar**, Professor of Nutrition and Food Sciences, Head of Department of Home Economics, Faculty of Specific Education, University of Alexandria, for her great support, guidance, supervision and advice throughout the study and her encouragement during the preparation of the manuscript.

I would also like to thank **Prof. Dr. Hussein Khamis Hussein** Professor of Physiology, Department of Zoology, Faculty of Science, Alexandria University for his efforts in reviewing the histological sections of this study

I would also like to thank **Prof. Dr. Ehab Mostafa Toson**, Professor of Cell Biology and Tissue Chemistry, Faculty of Science, Tanta University, for his wonderful work in bringing out the histological sectors in this study in such a good way

I would also like to express my sincere thanks, gratitude and appreciation to my family who bore a lot of trouble and have prayed for me and have stood beside me during all phases of the study and the preparation of the thesis.

Hoda Abdelrahman Yossef Shallan

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LIST OF ABBREVIATIONS

ACP	acid phosphatase
ALP	alkaline phosphatase
ALT	alanine aminotransferase
AST	aspartate aminotransferase
BW	Body weight
BWG	body weight gain
CAS	carotid artery stenosis
CAT	Catalase
CIMT	carotid intima–media thickness
CP	Cisplatin
CVD	Cardiovascular disease
Cyt c	cytochrome C
DOX	Doxorubicin
DZA	Diazinon
ECG	electrocardiographic
FBW	final body weight
Fe ²⁺	Ferrous
Fe ³⁺	Ferric ion
FN	urine fibronectin
GAG	glycosaminoglycan
GGT	gamma-glutamyl transferase
GPX	Glutathione Peroxidase
GSH	Reduced Glutathione
H ₂ O ₂	Hydrogen Peroxide
HDL-c	high- density lipoprotein-cholesterol
HF	heart failure
IBW	initial body weight

LDH	Lactate Dehydrogenase
LDL-c	low-density lipoprotein-cholesterol
LPL	lipoprotein lipase
MDA	Malondialdehyde
NADPH	Nicotinamide adenine dinucleotide phosphate hydrogen
NAG	N-acetyl-D-glucosaminidase
NCD	noncommunicable disease
NO	Nitric Oxide
O ⁻²	Superoxide Anions
OH	Hydroxyl
PARP	Poly (ADP-ribose) polymerase
PCC	protein carbonyl content
PFE	pomegranate fruit extract
PJ	Pomegranate juice
PM	Pomegranate molasses
PON1	paraoxonase 1
PPARc	Peroxisome proliferator activated receptor gamma
PUFAs	Polyunsaturated fatty acids
QT interval	Electrocardiography
ROS	reactive oxygen species
SOD	Super oxide dismutase
TAC	Total antioxidant capacity
TAC	Total Antioxidant Capacity
TAG	triacylglycerol
TBARS	Thiobarbituric acid reactive substances
TL	Total lipids
Top II	topoisomerase II
VLDL-c	very low-density lipoprotein-cholesterol

Abstract

Doxorubicin (DOX) is one of the most common and widely used chemotherapeutic agents for a variety of cancers. Doxorubicin has been shown to generate oxidative stress, which leads to hepatotoxicity and cardiotoxicity. Pomegranate molasses (PM) is a nutrient-dense substance. It contains four times the antioxidant content of pomegranate juice. Zinc, iron, calcium, and phosphorous are all abundant in it. The current study's goal is to see how doxorubicin affects the liver and heart in male rats, as well as how pomegranate molasses can help alleviate these side effects.

20 Male rats were randomly divided into four groups namely the control group, the pomegranate molasses group, the doxorubicin group, and the combination group.

Dox was given as a single injection into the peritoneum, while PM was given orally once daily for two weeks.

The body weight, as well as the weight of the liver and the heart, were not impacted in rats administered pomegranate molasses during the trial. NO and TBARS levels in plasma, liver, and heart were significantly lower in rats given pomegranate molasses alone. However, there was an increase in TAC, SOD, CAT, and GSH in plasma, liver, and heart. The activity of AST, ALT, and ALP enzymes in the plasma was significantly reduced, whereas the activity of AST, ALT, ALP, ACP, and GGT enzymes in the liver was significantly increased. It also resulted in a considerable drop in the concentration of all lipid profiles in plasma, with the exception of HDL-c, which increased.

On the other hand, rats given doxorubicin exhibited a drop in heart weight, but a considerable rise in gained weight and liver weight. Doxorubicin increased NO and TBARS levels in plasma, liver, and heart while it decreased TAC, SOD, CAT, and GSH levels in plasma, liver, and heart. Dox treatment increased the activity of AST, ALT, and ALP in plasma, but it decreased the activity of AST, ALT, ALP, ACP, and GGT in the liver. In comparison to the control group, doxorubicin treatment resulted in a considerable increase in plasma lipid levels, except the level of HDL-c which decreased.

The use of pomegranate molasses and doxorubicin in combination minimised organ damage and improved results.

While the pomegranate molasses group's liver and heart tissues exhibited a normal fibromuscular structure, the doxorubicin group's liver and heart tissues indicated several abnormalities at the cellular level

