UNIVERSITI PUTRA MALAYSIA

NUTRITIONAL COMPOSITION, TOXIC AND ANTIOXIDANT PROPERTIES OF AQUEOUS EXTRACTS OF Anacardium occidentale LINN. LEAVES AND THEIR POTENTIAL BENEFITS IN ATHEROSCLEROSIS-INDUCED RABBITS

MUHAMMAD NOR FAZALI BIN FAZIL

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MUHAMMAD NOR FAZALI BIN FAZIL

MASTER OF SCIENCE
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By

MUHAMMAD NOR FAZALI BIN FAZIL

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

September 2011
DEDICATION

It is with great pride that I dedicate this book to my parents,

Fazil Bin Ahmad
Zakiah Binti Abdul Halim

to my only sibling,

Noor Farhana Binti Fazil

to my wife,

Nursakinah Ismaail

May the blessing of Allah will be upon them
Thanks for your support and inspiration.
Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

NUTRITIONAL COMPOSITION, TOXIC AND ANTIOXIDANT PROPERTIES OF AQUEOUS EXTRACTS OF Anacardium occidentale LINN. LEAVES AND THEIR POTENTIAL BENEFITS IN ATHEROSCLEROSIS-INDUCED RABBITS

By

MUHAMMAD NOR FAZALI BIN FAZIL

September 2011

Chairman: Zulkhairi Amom, PhD

Faculty: Medicine and Health Sciences

Atherosclerosis is the main underlying pathology behind cardiovascular diseases (CVD), which is a major cause of disability and premature death in the world. This present study aimed to investigate the anti-atherosclerotic, hypocholesterolemic, changes in the erythrocyte antioxidant enzymes, hepatoprotective and toxicity effects of the aqueous extract of the leaves of Anacardium occidentale Linn. (AOE) in atherosclerosis-induced rabbits. In vitro antioxidative properties of AOE were assessed via DPPH free radical scavenging and ferric reducing antioxidant power assay (FRAP) while in vitro toxicity potential of AOE was determined via brine shrimp lethality test (BSLT). The total phenolic content of AOE was evaluated via Folin-Ciocalteau method. Atherosclerosis was induced by giving 0.5% high cholesterol diet and AOE of various doses (100, 200 and 400 mg/kg) were administered via force-feeding once daily for 12 weeks. Blood samples were withdrawn via ear vein lobe every 4 weeks.
It was demonstrated that AOE was not toxic, contain phenolic compounds and posses comparable antioxidant properties with Buthylated Hydroxytoluene (BHT) in free radical scavenging and FRAP assay. Supplementation of AOE to the experimental animals compared to the rabbits receiving the high cholesteriol diet alone significantly retarded (p<0.05) the atheromatous plaque formation and significantly lower (p<0.05) the low density lipoprotein and triglycerides levels. The extract also posses antioxidative effects \textit{in vivo} by significantly lower (p<0.05) the lipid peroxidation product (malondialdehyde) and was able to significantly increased (p<0.05) the catalase levels. The extract also exerts hepatoprotective effect by normalizing the liver enzymes (aspartate transaminase, alkaline phosphatase, alanine transaminase and gamma-glutamyltransferase). In conclusion, this study indicates the potential of AOE as anti-atherosclerotic, hypocholesterolemic and antioxidative agent.
Abstrak thesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

KANDUNGAN NUTRISI, KERACUNAN DAN ANTIOKSIDAN EKSTRAK AKUAS DAUN Anacardium occidentale LINN. DAN POTENSI KEBAIKANNYA DALAM ARNAB YANG DIARUH ATEROSKLEROTIK

Oleh

MUHAMMAD NOR FAZALI BIN FAZIL

September 2011

Pengerusi: Zulkhairi Amom, PhD

Fakulti: Perubatan dan Sains Kesihatan

Aterosklerosis adalah penyebab utama kepada penyakit berkaitan jantung, yang merupakan penyebab utama ketidakupayaan dan kematian di dunia. Kajian ini bertujuan untuk mengkaji kesan anti-aterosklerotik, penurun kolesterol, perubahan dalam status enzim antioksidan dalam darah, pelindung kerosakan hati dan potensi keracunan oleh ektrak akuas daun Anacardium occidentale Linn. (AOE) dalam arnab yang diaruh aterosklerosis. Kajin potensi AOE sebagai agen antioksidan secara in vitro dilakukan melalui kaedah asai radikal yang stabil 1,1-diphenyl-2-picrylhidrazyl (DPPH) dan asai kemampuan penurun ferum (FRAP) manakala potensi keracunan AOE dilakukan melalui ujian toksik benih udang (BSLT). Analisis jumlah kandungan fenolik dilakukan melalui kaedah Folin-Ciocalteau. Aterosklerosis diaruh melalui pemberian 0.5% diet berlebihan kolesterol manakala AOE diberikan dalam dos (100, 200 and 400 mg/kg) secara paksaan oral sekali sehari selama 12 minggu. Sampel darah diambil setiap 4 minggu melalui salur darah di telinga.
Hasil kajian menunjukkan bahawa AOE tidak toksik, mengandungi komponen fenolik yang tinggi dan menunjukkan potensi yang baik sebagai agen antioksida. Pemberian AOE kepada arnab yang diberikan kolesterol berlebihan berjaya menghalang pembentukan plak ateroma dengan signifikan (p<0.05) dan berjaya menurunkan kandungan lipoprotein berketumpatan rendah dan trigliserida dengan signifikan (p<0.05) berbanding dengan arnab yang tidak diberikan AOE. Ekstrak juga menunjukkan kesan sebagai agen aktioksida dalam kajian secara in vivo dengan mengurangkan pembentukan kandungan produk perosidasi lipid (malondialdehid) dan berjaya meningkatkan paras enzim katalase dalam darah secara signifikan (p<0.05). Ekstrak juga menunjukkan keupayaannya bertindak sebagai agen pelindung kerosakan hati apabila paras enzim hati tidak meningkat (aspartat transaminase, alkali phosphatese, alanin transaminase and gamma-glutamiltransferase) berbanding di dalam arnab yang diaruh kolesterol berlebihan. Kesimpulannya, kajian ini berjaya menunjukkan potensi AOE sebagai agen anti-aterosklerotik, penurun kolesterol dan antioksida.
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I wish to express my deepest appreciation and gratitude to my supervisor, Assoc Prof Dr Zulkhairi Bin Hj Amom for his invaluable guidance, constant encouragement and constructive comments and suggestions during the period of my candidature. Many thanks also to my co-supervisor, Assoc Prof Dr Norhaizan Binti Mohd Esa and to Dr Norhafizah Binti Mohtarudin for her guidance in the histopathological analysis.

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May the Blessings of Allah will be upon all of you. Thank you.
This thesis was submitted to the senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

**Zulkhairi Hj Amom, PhD**  
Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Chairman)

**Norhaizan Mohd Esa, PhD**  
Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Member)

_______________________________  
BUJANG BIN KUM HUAT, PhD  
Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia  
(Date: )
APPROVAL

I certify that a Thesis Examination Committee has met on 23rd September 2011 to conduct the final examination of Muhammad Nor Fazali Bin Fazil on his thesis entitled Nutritional Composition, Toxic and Antioxidant Properties of Aqueous Extracts of Anacardium occidentale Linn. Leaves and Their Potential Benefits in Atherosclerosis-Induced Rabbits in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The committee recommends that the student be awarded the Master of Science.

Member of the Examination Committee were as follows

Dr Fauziah Othman, PhD  
Professor,  
Faculty of Medicine and Health Sciences,  
Universiti Putra Malaysia  
(Chairman)

Dr Mohamed Ali Rajion, PhD  
Professor,  
Faculty of Veterinary,  
Universiti Putra Malaysia  
(Internal Examiner)

Dr Mohamad Taufik Hidayat Baharuldin, PhD  
Lecturer,  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Internal Examiner)

Dr Jamaludin Mohamed, PhD  
Professor,  
Faculty of Medicine and Health Sciences,  
Universiti Kebangsaan Malaysia,  
Malaysia.  
(External Examiner)

Buang Dr pada nama

SEOW HENG FONG, PhD  
Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia
DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledge. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any institution.

MUHAMMAD NOR FAZALI BIN FAZIL

Date:
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