



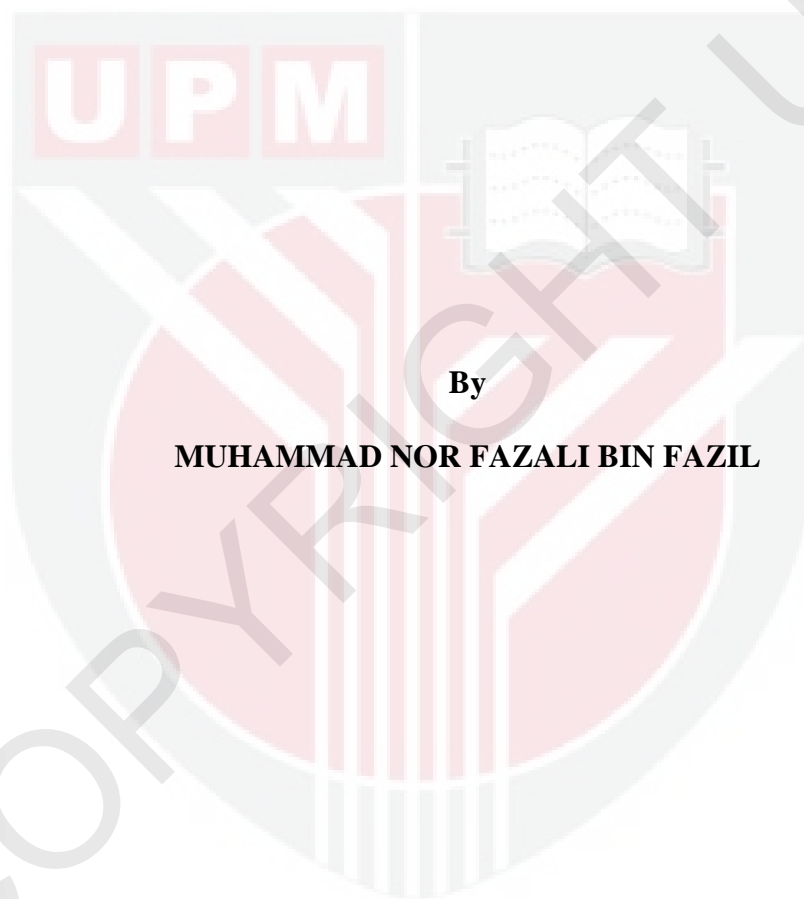
UNIVERSITI PUTRA MALAYSIA

**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

FPSK(m) 2011 24

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By

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**MASTER OF SCIENCE
UNIVERSITI PUTRA MALAYSIA**

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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 Isemail

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

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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-Ciocalteu 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 Blood samples were withdrawn via ear vein lobe every 4 weeks.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 cholesterol 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 *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

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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 ekstrak akuas daun *Anacardium occidentale* Linn. (AOE) dalam arnab yang diaruh aterosklerosis. Kajian potensi AOE sebagai agen antioksidan secara *in vitro* dilakukan melalui kaedah asai radikal yang stabil 1,1-diphenyl-2-picrylhydrazyl (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-Ciocalteu. 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 antioksidasi. 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 antioksidasi 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 phosphatase, 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 antioksidasi.

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Last but not least to my parents, Fazil Bin Ahmad and Zakiah Binti Abdul Halim, and not forgetting my little sister and the only my sibling that I have, Noor Farhana Binti Fazil for their enormous amount of love, understanding, sacrifice and steadfast support that have made the task of completing this project possible.

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:

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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.

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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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