



UNIVERSITI PUTRA MALAYSIA

**EFFECTS OF ANTIOXIDANT ACTIVITY AND LIPID LOWERING
PROPERTIES OF DATES (*Phoenix dactylifera* L.) FROM LIBYA ON
CHOLESTEROL-FED RABBITS**

NAWAL SALEM AB. HASAN

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BY

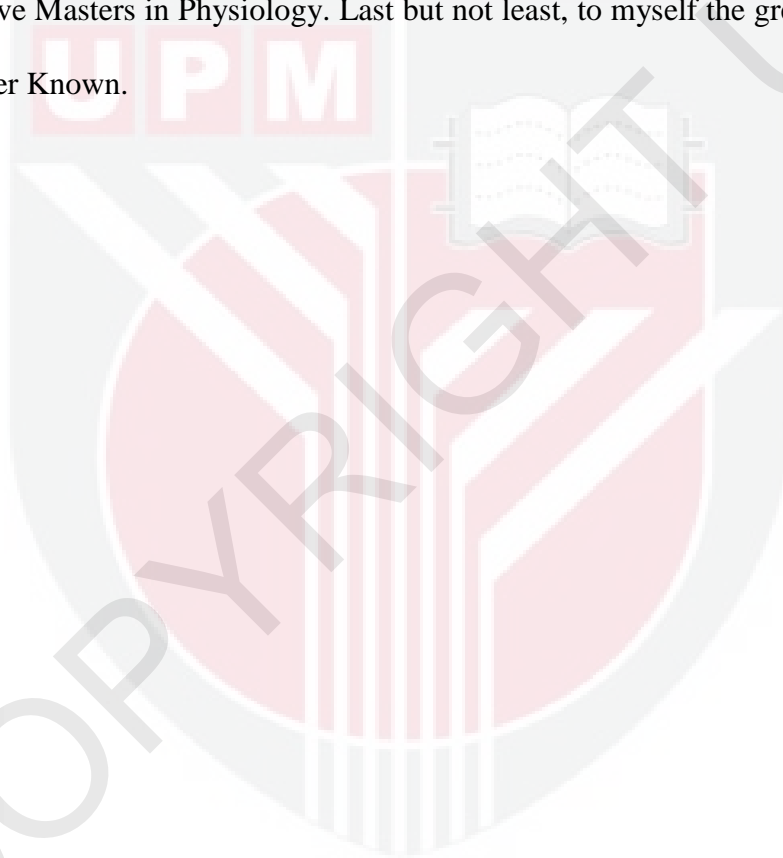
NAWAL SALEM AB. HASAN

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

April 2011

DEDICATION

To my husband for giving inspiration and passion to pursue my study in this field. Special appreciation also to my mentor, Prof. Madya. Dr. Zulkhairi Amom who had contributed greatly towards my career development and personal growth. My longtime best friend, Miss Noramalina Isemaail for all her effort and dedication in my journey to achieve Masters in Physiology. Last but not least, to myself the greatest motivator I have ever Known.



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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

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By

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April 2011

Chairman : Associate Professor Zulkhairi bin Haji Amom, PhD

Faculty : Medicine and Health Sciences

Cardiovascular diseases (CVD) are number one cause of death globally and are expected to remain as the leading cause of death in 2015. According to World Health Organization (WHO), one of the most prominent underlying pathology of CVD is atherosclerosis. The aim of this study is to evaluate the anti-oxidative and lipid-lowering effect of dates (*Phoenix Dactylifera-L*) flesh aqueous extract, on hypercholesterolemic induced rabbit. The in vitro study was conducted to determine the total antioxidant activity of dates aqueous extract. The scavenging activity of dates was measured using 1-diphenyl-2-picrylhydrazyl (DPPH) method and iron (3) reduction (FRAP) assay. The Total Phenolic Content (TPC) of the date was measured using the Folin-Ciocalteu method. Experimental design used adult male New Zealand white rabbits (seven animals/group) with an average body weight of 2.2-2.8 kg. Following one week acclimatization, the animals were segregated into seven groups as the

following: Normal control group, Hypercholesterolemic control group, Simvastatin group and Four treatment groups. The study was designed for 10 weeks and 20ml of ear lobe venous blood samples were taken at 0 week, 5 week, and 10 week, plasma samples obtained were analysed for biochemical measurements. The whole aortas were excised for macroscopy and microscopy studies. The proximate composition of date was found to be high in carbohydrates, total sugar, minerals and vitamins; and a relatively low content of protein, ash and soluble and insoluble dietary fibers. The date sample exhibited lower free radical scavenging activity (87.66%) than the BHT, however the FRAP value obtained for date sample (13.46 mmol/L) was comparable to those of vitamin C and BHT (13.73 mmol/L and 13.75mmol/L) respectively. The supplementation of 125 and 250 mg/kg/day of date extract reduced plasma total cholesterol (TC), low-density lipoprotein (LDL) and triglycerides (TG) levels concomitantly groups supplemented with date extract (T125, T250, T500 and T1000) were significantly higher ($P<0.05$) in high density lipoprotein (HDL) in diet of induced hypercholesterolemic rabbit. The atherogenic index (AI) and sdLDL values were found to be lower in date extract treated groups compared to hypercholesterolemia group (HC) ($P<0.05$). A significant reduction of lipid peroxidation (LPO) index indicated with low MDA levels ($P<0.05$) in groups treated with date extract compared to HC group. At week 10, groups treated with date extract (T125, T250, T500 and T1000) were significantly higher ($P<0.05$) in total antioxidant activity compared to HC group. No foam cell formation was visible in the aorta of rabbits in groups NC and T250. However, there was visible foam cell formation in the aorta of groups HC, SC, T125, T500 and T1000. In conclusion, results showed that supplementation of 250 mg/kg of dates extract would be able to reduce or retard the progression of atherosclerotic plaque development induced by dietary cholesterol. The enhanced serum HDL, increase in antioxidant status and flavonoids composition may be the possible underlying mechanism of antiatherogenic effect of dates.

Abstrak tesis ini yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**KESAN AKTIVITI ANTIOKSIDAN DAN CIRI PERENDAH LEMAK BUAH
KURMA (*Phoenix dactylifera* L) DARI LIBYA
KE ATAS ARNAB YANG DIBERI DIET KOLESTEROL**

Oleh

NAWAL SALEM AB. HASAN

April 2011

Pengerusi : Prof Madya Zulhairi bin Haji Amom, PhD

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Penyakit kardiovaskular adalah penyebab kematian nombor satu di dunia dan dijangka akan terus mendahului sebagai penyebab kematian pada tahun 2015. Berdasarkan Organisasi Kesihatan Dunia (WHO), salah satu faktor utama penyumbang kepada penyakit kardiovaskular adalah aterosklerosis. Tujuan kajian ini adalah untuk menguji kesan antioksidan dan penurunan lipid oleh ekstrak buah kurma (*Phoenix Dactylifera* L) ke atas arnab yang teraruh hiperkolesterolemik. Kajian *in vitro* telah dijalankan bagi menentukan jumlah aktiviti antioksidan oleh ekstrak akuas buah kurma. Aktiviti antioksidan oleh ekstrak buah kurma diukur menggunakan kaedah 1-diphenyl-2-picrylhydrazyl (DPPH) dan iron (3) reduction (FRAP). Jumlah Kandungan Fenolik bagi ekstrak buah kurma diukur menggunakan kaedah Folin-Ciocalteu. Arnab jantan jenis New Zealand white digunakan sebagai subjek di dalam eksperimen ini dengan berat purata 2.2-2.8 kg. Selepas seminggu, haiwan-haiwan tersebut dibahagikan

kepada tujuh kumpulan seperti berikut: Kumpulan Normal, Kumpulan Hiperkolesterolemik, Kumpulan Simvastatin dan empat Kumpulan Rawatan. Kajian ini dijalankan selama 10 minggu dan 20ml darah daripada salur darah di telinga diambil pada minggu 0, minggu ke-5 dan minggu ke-10, sampel plasma kemudian diambil untuk ujian biokimia. Aorta arnab diambil untuk kajian makroskopi dan mikroskopi. Kandungan proksimat buah kurma mendapati, tinggi dengan karbohidrat, jumlah gula, garam mineral dan vitamin; dan mengandungi protein, abu dan serat larut dan serat tidak larut yang rendah. Sampel buah kurma didapati mempunyai radikal bebas aktiviti yang rendah (87.66%) daripada BHT, tetapi nilai FRAP untuk sampel buah kurma (13.46 mmol/L) adalah setara dengan nilai bagi Vitamin C dan BHT (13.73 mmol/L and 13.75mmol/L). Pemberian ekstrak buah kurma sebanyak 125 dan 250 mg/kg/hari didapati merendahkan jumlah kolesterol di dalam plasma, lipoprotein ketumpatan rendah dan trigliserida bagi kumpulan yang menerima ekstrak buah kurma (T125, T250, T500 dan T1000) adalah lebih tinggi secara signifikan ($p < 0.05$) daripada lipoprotein ketumpatan tinggi pada arnab yang teraruh hiperkolesterolemik secara diet. Nilai aterogenik indeks dan sdLDL didapati lebih rendah daripada kumpulan yang diberi rawatan dengan ekstrak buah kurma berbanding kumpulan hiperkolesterolemia (HC) ($P < 0.05$). Terdapat penurunan secara signifikan oksidasi lipid berdasarkan nilai MDA yang rendah ($p < 0.05$) pada kumpulan rawatan berbanding kumpulan HC. Pada minggu ke-10, kumpulan yang dirawat dengan ekstrak buah kurma (T125, T250, T500 dan T1000) menunjukkan jumlah antioksidan activity yang lebih tinggi ($P < 0.05$) berbanding kumpulan HC. Tetapi, terdapat pembentukan buih sel yang nyata pada aorta haiwan di kumpulan HC, SC, T125, T500 dan T1000. Kesimpulannya, hasil kajian mendapati pemberian ekstrak buah kurma sebanyak 250 mg/kg dapat merendahkan dan melambatkan kadar pembentukan

plak atherosclerosis teraruh oleh kolesterol makanan. Peningkatan serum HDL, status antioksidan dan komposisi flavonoid berkemungkinan besar memainkan peranan dalam kesan antiaterogenik oleh buah kurma.



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I certify that an Examination Committee has met on 2011 to conduct the final examination of Nawal Salem Ab. Hasan on her Master of Science thesis entitled “Antioxidant Activities and Lipid Lowering Properties of Dates (*Phoenix dactylifera* L.) from Libya on cholesterol fed Rabbits” in accordance with University Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the student be awarded the degree of Master of Science.

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DECLARATION

I declare that the thesis is my original work except for questions and citations which have been duly acknowledged. 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.



NAWAL SALEM AB. HASAN

Date: 26 April 2011

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