



**UNIVERSITI PUTRA MALAYSIA**

***TAMARINDUS INDICA* L. PULP AQUEOUS EXTRACT EFFECTS IN  
HIGH FAT DIET-INDUCED OBESE SPRAGUE-DAWLEY RATS**

**KHAIRUNNUUR FAIRUZ AZMAN**

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**By**

**KHAIRUNNUUR FAIRUZ AZMAN**

**Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
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**June 2010**

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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**June 2010**

**Chairman: Zulkhairi Haji Amom, PhD**

**Faculty : Medicine and Health Sciences**

The present study addressed the anti-obesity, hypolipemic and antioxidative effects of the crude aqueous extract of the pulp fruit of *Tamarindus indica* L. on diet-induced obese rats *in vivo*, as well as the extract's antioxidant action and toxicity potential, *in vitro*. *In vitro* antioxidative properties of the *T. indica* extract were assessed via DPPH free radical scavenging assay, ferric-reducing antioxidant power (FRAP) assay and Folin-Ciocalteau method. Toxicity potential of the extract was determined *in vitro* via brine shrimp lethality test (BSLT). To assess its *in vivo* anti-obesity, hypolipemic and antioxidative effects, *T. indica* extract of various doses (5 mg/kg, 25 mg/kg and 50 mg/kg) were administered to prior high-fat diet induced obese rats via force-feeding once daily for 10 weeks. Blood sample was withdrawn via cardiac puncture under diethyl ether anesthesia. The blood sampling was performed five times of five weeks interval for each rat.

*In vitro*, the *T. indica* extract presented radical scavenging ability, as assessed by DPPH and FRAP assays. A strong correlation was observed between the phenolics concentration of the extracts and its antioxidant potency which indicated that the phenolics content was likely to contribute to the antioxidant activity of the extracts. Brine shrimp lethality test (BSLT) results showed that the *T. indica* extract was virtually non-toxic to the shrimps.

*In vivo*, the *T. indica* extract was proven to have weight reduction and hypolipemic effects in which the group that was given the extract had significantly lower ( $p < 0.05$ ) body weight, plasma lipid profile (cholesterol, low density lipoprotein and triglyceride), insulin, glucose and leptin levels in compare to the untreated obese group. The anti-obesity action of *T. indica* extract is possibly via lowering of plasma fatty acid synthase (FAS) levels. The extract was also proven to possess antioxidative effects; indicated by decreased MDA levels and increased Superoxide Dismutase (SOD) and Glutathione Peroxidase (GPx) enzymes activities.

The supplementation of *T. indica* extract to the experimental animals was proven to be safe and non-toxic to the animals' liver indicated by the reversal of the liver enzymes (Aspartate Transaminase, Alkaline Phosphatase, Alanine Transaminase and Gamma-glutamyltransferase) levels (which was increased earlier prior to high-fat diet induction) to be almost similar with the normal control group. Histological study of the liver showed *hepatic steatosis* state in the diet-induced obese rats. The administration of the *T. indica* extract caused amelioration of fatty liver and significant decrease ( $p < 0.05$ ) of adipose tissue weights than that of the untreated obese group. In conclusion, this study

indicates the potential of *T. indica* pulp extract as anti-obesity, hypolipemic and antioxidative agent.



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

**KESAN EKSTRAK AKUEUS BUAH *TAMARINDUS INDICA* L. KE ATAS  
TIKUS SPRAGUE-DAWLEY YANG TERARUH OBESITI  
SECARA DIET TINGGI LEMAK**

Oleh

**KHAIRUNNUUR FAIRUZ AZMAN**

**Jun 2010**

**Pengerusi: Zulkhairi Haji Amom, PhD**

**Fakulti: Perubatan dan Sains Kesihatan**

Kajian ini mengetengahkan kesan anti-obesiti, hipolipemik dan antioksidatif ekstrak berair buah *Tamarindus indica* L. Ekstrak ini telah diuji pada tikus yang teraruh obesiti secara *in vivo*. Aktiviti antioksidan ekstrak *T. indica* diuji secara *in vitro* dengan menggunakan asai DPPH, asai FRAP dan kaedah Folin-Ciocalteu. Potensi keracunan ekstrak diuji secara *in vitro* melalui ujian keracunan anak udang (BSLT). Untuk mengkaji kesan anti-obesiti, hipolipemik dan antioksidatif secara *in vivo*, ekstrak *T. indica* pada tiga dos (5 mg/kg, 25 mg/kg dan 50 mg/kg) diberikan kepada tikus yang telah diaruh obesiti menggunakan diet tinggi lemak. Ekstrak diberikan secara paksaan oral sekali sehari selama 10 minggu. Sampel darah diambil melalui tusukan jantung setelah tikus dibius menggunakan dietil eter. Sampel darah setiap tikus diambil sebanyak lima kali setiap lima minggu.

*In vitro*, ekstrak *T. indica* menunjukkan kebolehan meneutralkan radikal bebas apabila diuji dengan asai DPPH dan FRAP. Terdapat korelasi yang kuat antara kepekatan fenolik ekstrak dan potensi antioksidannya yang menunjukkan bahawa kandungan fenolik inilah yang menyumbang kepada aktiviti antioksidan ekstrak. Keputusan ujian BSLT menunjukkan bahawa ekstrak *T. indica* tidak toksik kepada udang yang diuji.

*In vivo*, ekstrak *T. indica* telah dibuktikan berkesan menurunkan berat badan dan kesan hipolipemik dimana kumpulan yang telah diberikan ekstrak menunjukkan berat badan, aras profil lemak (kolesterol, lipoprotein ketumpatan rendah dan trigliserida) plasma dan aras leptin yang lebih rendah secara signifikan berbanding kumpulan obes yang tidak dirawat. Kesan anti-obesiti ekstrak *T. indica* ini berkemungkinan disebabkan oleh kebolehannya menurunkan aras enzim asid lemak sintase (FAS) plasma. Ekstrak *T. indica* juga dibuktikan mempunyai kesan antioksidatif; yang ditunjukkan oleh pengurangan kepekatan MDA dan peningkatan aktiviti enzim Superoksida Dismutase (SOD) dan Glutathione Peroksida (GPx).

Supplementasi ekstrak *T. indica* kepada haiwan eksperimen dibuktikan adalah selamat dan tidak toksik kepada hepar haiwan tersebut yang ditunjukkan oleh pengurangan semula aras enzim hepar (Aspartate Transaminase, Alkaline Fosfatase, Alanine Transaminase and Gamma-glutamyltransferase) (yang sebelumnya meningkat disebabkan oleh aruhan diet tinggi lemak) ke aras yang setara dengan kumpulan kawalan normal. Kajian histologi pada hepar menunjukkan keadaan '*hepatic steatosis*' pada tikus yang teraruh obesiti. Pemberian ekstrak *T. indica* menyebabkan pembaikpulihan hepar berlemak dan penurunan signifikan berat tisu adipos berbanding kumpulan obes yang

tidak diberikan sebarang rawatan. Kesimpulannya, kajian ini menunjukkan potensi ekstrak *T. indica* sebagai agen anti-obesiti, hipolipemik dan antioksidatif.



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I certify that an Examination Committee has met on 21<sup>st</sup> June 2010 to conduct the final examination of Khairunnuur Fairuz Azman on her Master of Science thesis entitled “*Tamarindus indica* L. (Asam Jawa) Pulp Aqueous Extract and Its Effects In High-Fat-Diet-Induced Obese Sprague-Dawley Rats” in accordance with Universiti 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.

Members of the Examination Committee were as follows:

**Sabrina Sukardi, PhD**

Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Chairman)

**Goh Yong Meng, PhD**

Faculty of Veterinary Medicine  
Universiti Putra Malaysia  
(Internal Examiner)

**Zuraini Ahmad, PhD**

Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Internal Examiner)

**Suriah Abdul Rahman, PhD**

Professor  
Faculty of Science and Technology  
Universiti Kebangsaan Malaysia  
(External Examiner)

---

**BUJANG KIM HUAT, PhD**

Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment 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)

**Hairuszah Ithnin, PhD**

Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Member)

**Azrina Azlan, PhD**

Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Member)

---

**HASANAH MOHD GHAZALI, PhD**

Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 21 October 2010

## DECLARATION

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



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**KHAIRUNNUUR FAIRUZ AZMAN**

Date: 21 June 2010

## TABLE OF CONTENTS

	<b>Page</b>
<b>ABSTRACT</b>	ii
<b>ABSTRAK</b>	v
<b>ACKNOWLEDGEMENTS</b>	viii
<b>APPROVAL</b>	x
<b>DECLARATION</b>	xii
<b>LIST OF TABLES</b>	xvii
<b>LIST OF FIGURES</b>	xviii
<b>LIST OF ABBREVIATIONS</b>	xxi
<b>CHAPTER</b>	
<b>1 INTRODUCTION</b>	<b>1</b>
<b>2 LITERATURE REVIEW</b>	<b>4</b>
2.1 Lipid Metabolism	4
2.1.1 Lipid	4
2.1.2 Lipid Digestion and Absorption	4
2.1.3 The Pathways of Lipid Transport	5
2.1.3.1 Exogenous (Dietary) Lipid Pathway	6
2.1.3.2 Endogenous Lipid Pathway	6
2.1.3.3 Reverse Cholesterol Transport	9
2.1.4 Fatty Acid Synthase	11
2.2 Adipose Tissue as a Source and Target for Novel Therapies	14
2.2.1 Morphology and Development of Adipose Tissue	14
2.2.2 Adipose Tissue Metabolism	16
2.2.3 Adipose Derived Hormones : Leptin	19
2.2.4 Insulin Receptor Signaling	22
2.3 Free Radical, Oxidative Stress and Antioxidant Defense System	26
2.3.1 Free Radical and Lipid Peroxidation	26
2.3.2 Enzymatic Antioxidants Activities	28
2.3.3 Phenolic Compounds and Other Antioxidants	31
2.4 Obesity – Clinical Aspects	32
2.4.1 Concept of Obesity : Definition and Description	32
2.4.2 Diagnosis and Clinical Evaluation	33
2.4.3 Prevalence of Obesity	34
2.4.4 Obesity Contributing Factors	36
2.4.5 Diet-induced Obese Rats as an Obesity Model	37
2.4.6 Management and Therapy of Obesity	38
2.5 Medicinal Plants as Obesity Alternative Treatment	40
2.5.1 Anti-obesity Effects of Medicinal Plants	40
2.5.2 <i>Tamarindus indica</i> L. : A Plant of Many Uses	42

3	<b>NUTRITION COMPOSITION, <i>IN VITRO</i> ANTIOXIDANT ACTIVITY AND BRINE SHRIMP LETHALITY EFFECTS OF AQUEOUS EXTRACTS OF <i>TAMARINDUS INDICA</i> L. PULPS AND SEEDS</b>	46
3.1	Introduction	46
3.2	Materials and Methods	47
3.2.1	Chemical Reagents	47
3.2.2	Equipments and Materials	48
3.2.3	Preparation of <i>T. indica</i> pulp and seed extracts	48
3.2.4	Proximate and Mineral Analysis	49
3.2.5	2,2-diphenyl-1-picrylhydrazyl (DPPH) Radical Scavenging Assay	49
3.2.6	Ferric Reducing Antioxidant Power (FRAP) Assay	50
3.2.7	Total Phenolic Content	50
3.2.8	Brine Shrimp Lethality Test	51
3.2.9	Statistical Analysis	52
3.3	Results	52
3.3.1	Proximate Analysis and Mineral Contents	52
3.3.2	2,2-diphenyl-1-picrylhydrazyl (DPPH) Radical Scavenging Assay	55
3.3.3	Ferric Reducing Antioxidant Power (FRAP) Assay	55
3.3.4	Total Phenolic Content	58
3.3.5	Correlation of DPPH and FRAP Activities with Total Phenolic Content	60
3.3.6	Brine Shrimp Lethality Test	60
3.4	Discussion	63
3.5	Conclusion	67
4	<b>THE EFFECTS OF <i>TAMARINDUS INDICA</i> L. PULP AQUEOUS EXTRACT SUPPLEMENTATION ON BODY WEIGHT, FOOD INTAKE, PLASMA LEPTIN, INSULIN, GLUCOSE AND FATTY ACID SYNTHASE LEVELS IN DIET-INDUCED OBESE RATS</b>	68
4.1	Introduction	68
4.2	Materials and Methods	70
4.2.1	Chemical Reagents	70
4.2.2	Equipments and Materials	70
4.2.3	Preparation of <i>T. indica</i> Pulp Extract	71
4.2.4	Experimental Design	71
4.2.5	High-Fat Diet Ingredients and Preparation	74
4.2.6	Blood Sampling	76
4.2.7	Bodyweight and Food Intake	77
4.2.8	Plasma Leptin Analysis	77
4.2.9	Plasma Fatty Acid Synthase (FAS) Analysis	78
4.2.10	Plasma Insulin Analysis	78
4.2.11	Fasting Blood Glucose Level Determination	79
4.2.12	Statistical Analysis	80

4.3	Results	80
4.3.1	Food Intake	80
4.3.2	Body Weight	82
4.3.3	Plasma Leptin Level	82
4.3.4	Plasma Fatty Acid Synthase (FAS) Level	86
4.3.5	Plasma Insulin Level	88
4.3.6	Fasting Blood Glucose Level	90
4.4	Discussion	92
4.5	Conclusion	97
<b>5</b>	<b>THE EFFECTS OF <i>TAMARINDUS INDICA</i> L. PULP AQUEOUS EXTRACT SUPPLEMENTATION ON PLASMA LIPID PROFILES, LIPID PEROXIDATION INDEX AND ANTIOXIDANT ENZYMES ACTIVITIES IN DIET-INDUCED OBESE RATS</b>	<b>98</b>
5.1	Introduction	98
5.2	Materials and Methods	100
5.2.1	Chemical Reagents	100
5.2.2	Equipments and Materials	100
5.2.3	Preparation of <i>T. indica</i> Pulp Extract	100
5.2.4	Experimental Design	101
5.2.5	Blood Sampling	101
5.2.6	Plasma Lipid Profile Analysis	101
5.2.7	Malondialdehyde (MDA) Level Determination	105
5.2.8	Protein Level Determination	106
5.2.9	Superoxide Dismutase (SOD) Activity Determination	106
5.2.10	Glutathione Peroxidase (GPx) Activity Determination	107
5.2.11	Statistical Analysis	108
5.3	Results	109
5.3.1	Plasma Lipid Profile	109
5.3.2	Plasma Malondialdehyde (MDA) Level	117
5.3.3	Antioxidant Enzymes Level	119
5.4	Discussion	123
5.5	Conclusion	128
<b>6</b>	<b>THE EFFECTS OF <i>TAMARINDUS INDICA</i> L. PULP AQUEOUS EXTRACT SUPPLEMENTATION ON ORGANS WEIGHTS, LIVER HISTOLOGY AND PLASMA LIVER ENZYMES LEVELS IN DIET-INDUCED OBESE RATS</b>	<b>129</b>
6.1	Introduction	129
6.2	Materials and Methods	130
6.2.1	Chemical Reagents	130
6.2.2	Equipments and Materials	131
6.2.3	Preparation of <i>T. indica</i> Pulp Extract	131
6.2.4	Experimental Design and Blood Sampling	131
6.2.5	Organ Collection	131
6.2.6	Histological Study of Liver	132
6.2.7	Liver Function Test (LFT) Analysis	135

6.2.8	Statistical Analysis	137
6.3	Results	138
6.3.1	Adipose Tissue and Organ Weights	138
6.3.2	Liver Histology	141
6.3.3	Plasma Liver Function Test	144
6.4	Discussion	151
6.5	Conclusion	154
7	<b>GENERAL DISCUSSION</b>	155
8	<b>CONCLUSION</b>	159
	<b>REFERENCES</b>	161
	<b>APPENDICES</b>	183
	<b>BIODATA OF STUDENT</b>	187
	<b>LIST OF PUBLICATIONS</b>	188