



UNIVERSITI PUTRA MALAYSIA

**NUTRITIONAL COMPOSITION AND ANTIOXIDANT ACTIVITIES OF
Ficus Carica L. FRUITS AND LEAVES FROM SAUDI ARABIA**

FATIMAH GHAZI HILAL ALQATHAMA

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By

FATIMAH GHAZI HILAL ALQATHAMA

**Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfillment of the Requirement for the Degree of Master of Science**

December 2012

DEDICATION

This thesis is dedicated to my parents and who have supported me all the way since the beginning of my studies and for instilling the importance of hard work. Also, this thesis is dedicated to my brothers who have been a great source of motivation and patience and understanding. My sisters, who offered me unconditional love, support throughout the course and encouragement. Thanks also to my friends, who were always willing to partake. Finally, I offer my regards and blessings to all of those who supported me in any respect during the completion of the project.

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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Chairman: Asmah bt Rahmat, PhD

Faculty: Medicine and Health Sciences

Traditional medicines derived from medicinal plants are used by about 60% of the world's population. Fruits and herbs contain constituents which have antioxidant properties and may have an inhibitory effect on free radical-induced oxidative damage to biological substances and tissues. Studies of the effective antioxidants in fruits and herbs may provide a great potential in prevention of disease. *Ficus carica* have been identified as one of the nutritional sources of antioxidants. In this study the total phenolic compounds, antioxidant activity and nutritional value in *F. carica* fruits and leaves from Saudi Arabia was investigated. The total phenolic content (Folin-Ciocalteu assay), antioxidant capacity FRAP assay (Ferric Reducing Antioxidant Power) and DPPH assay (1, 1-diphenyl-2-picrylhydrazyl) were determined (methanol and aqueous extract using solvent. In addition, vitamins C and E contents in *Ficus carica* was also investigated using high performance liquid chromatography (HPLC),

as well as mineral using atomic absorption spectrophotometric (AAS) methods was also evaluated. This research was focused on two species of *F. carica*. Both Hamat and Balas were differentiated according to the size of fruits and leaves. The results indicated that the Hamat fruit had greater antioxidant capacity, total phenols, and ascorbic acid content than Balas fruits. Aqueous extract of Hamat had a significantly much higher content of total phenolic 347.31 ± 4.38 mg GAE/100g while methanolic extract 229.15 ± 1235 mg GAE/100g. The aqueous extract of Hamat had the higher DPPH radical scavenging activity $83.67 \pm 1.19\%$ than Balas fruit $46.02 \pm 2.87\%$. Balas leaf aqueous extract achieved the higher percentage of radical scavenging activity $74.58 \pm 1.60\%$ compared to methanolic extract $63.29 \pm 2.5174\%$. Balas fruit had the high carbohydrate content 19.2 ± 0.17 and low fat content 0.3 ± 0.14 g /100 g. The Balas leaf had high protein content 5.1 ± 0.46 and fat content 1.3 ± 0.35 g /100 g. Additionally, both leaves and fruits were shown to contain high amounts of minerals as well as vitamins C and E. In summary, both *F. carica* fruits and leaves are good sources of dietary antioxidants and processing products as dietary supplements. The *F. carica* are rich in mineral elements especially in calcium and potassium and also good nutritional composition. *F. carica* seems to contain high amounts of phenolic compounds with antioxidant activities as well as a good natural source of antioxidants which may potentially reduce the oxidative stress (triggered by chronic diseases). Thus, *F. carica* could be considered as an alternative and potential source of natural antioxidant. Generally, the present study showed *Ficus carica* juice and its components are good source of macronutrients. *F. carica* juices are rich in antioxidant vitamins. In the current study, the DDPH and FRAP indicates a strong antioxidant activities, this could be due to total phenolic content and vitamins of *F. carica* juice.

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

**KOMPOSISI PEMAKANAN DAN AKTIVITI ANTIOKSIDAN BUAH DAN
DAUN *Ficus Carica L.* DARI SAUDI ARABIA**

Oleh

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Perubatan tradisional daripada tumbuhan dengan ciri perubatan telah digunakan sebanyak 60% populasi dunia. Buah-buahan dan herba-herba mengandungi konstituen yang menunjukkan ciri antioksidan dan mungkin mempunyai kesan perencatan ke atas radikal bebas yang menginduksi masalah oksidasi kepada bahan biologi dan tisu. Kajian tentang antioksidan yang efektif di dalam buah dan herba boleh memberi potensi hebat dalam pencegahan penyakit. *Ficus carica* telah dikenalpasti sebagai salah satu sumber antioksidan. Dalam kajian ini, jumlah polifenol, aktiviti antioksidan dan nilai pemakanan dalam buah *Ficus carica* dan daun spesies dari Saudi Arabia ini telah ditentukan. Jumlah kandungan polifenol (kaedah Folin-Ciocalteu), kapasiti antioksidan FRAP kaedah penurunan ion ferum/potensi antioksidan dan DPPH kaedah 1,1-diphenyl-2-picrylhydrazyl telah ditentukan (ekstrak metanol dan akueus digunakan sebagai pelarut). Tambahan lagi, kandungan vitamin C dan E dalam *Ficus carica* juga ditentukan menggunakan kromatografi cecair berprestasi tinggi (HPLC) serta mineral menggunakan kaedah spektrofotometri penyerapan atom (AAS) telah dinilai. Penyelidikan ini telah difokuskan ke atas dua spesies *F. carica*. Kedua-dua

Hamat dan Balas telah dibezakan berdasarkan saiz buah dan daun. Keputusan menunjukkan buah Hamat mempunyai kapasiti antioksidan, jumlah polifenol dan asid askorbik yang lebih tinggi daripada buah Balas. Ekstrak akueus Hamat mempunyai kandungan yang signifikan bagi jumlah polifenol (347.31 ± 4.38 mg GAE/100g), manakala ekstrak metanol 229.15 ± 1235 mg GAE/100g. Ekstrak akueus Hamat mempunyai aktiviti penghapusan radikal DPPH yang lebih tinggi ($83.67 \pm 1.19\%$) daripada buah Balas ($46.02 \pm 2.87\%$). Ekstrak akueus daun Balas mencapai peratus aktiviti penghapusan radikal yang lebih tinggi ($74.58 \pm 1.60\%$) berbanding dengan ekstrak methanol ($63.29 \pm 2.52\%$). Buah Balas mempunyai tinggi kandungan karbohidrat 19.2 ± 0.17 dan rendah lemak 0.3 ± 0.14 g /100 g. Manakala daun Balas mempunyai tinggi kandungan protein 5.1 ± 0.46 dan kandungan lemak 1.3 ± 0.35 g /100 g. Tambahan itu, kedua-dua daun dan buah telah menunjukkan tinggi kandungan mineral serta vitamin C dan E. Sebagai ringkasan, kedua-dua buah dan daun *F. carica* adalah sumber antioksidan yang bagus digunakan dalam pembuatan produk seperti diet tambahan. *F. carica* adalah kaya dalam kandungan mineral terutama kalsium dan kalium serta komposisi pemakanan yang bagus. *F. carica* mengandungi tinggi kandungan kompaun polifenol dengan aktiviti antioksidan serta sumber antioksidan semula jadi yang bagus di mana mungkin berpotensi mengurangkan stress oksidatif (dicetuskan dari penyakit kronik). Maka, *F. carica* boleh dipertimbangkan sebagai alternatif dan sumber potensi antioksidan semula jadi. Secara umum, kajian ini menunjukkan jus *Ficus carica* dan komponennya adalah sumber yang bagus dengan makronutrien. Jus *Ficus carica* juga kaya dengan vitamin antioksidan. Dalam kajian ini, DPPH dan FRAP menunjukkan aktiviti antioksidan yang tinggi, ini boleh disebabkan kehadiran kandungan jumlah polifenol dan vitamin dalam jus *Ficus carica*.

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I certify that a Thesis Examination Committee has met on 21 Disember 2012 viva voce to conduct the final examination of Fatimah Ghazi Hilal Alqathama on her thesis entitled " Nutritional Composition and Antioxidant Activities of *Ficus Carica* L. Fruits and Leaves From Saudi Arabia " 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 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 other institutions.



FATIMAH GHAZI HILAL ALQATHAMA

Date : 21-12-2012

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