

NUTRITIONAL VALUE OF THE RED  
SEAWEED, *Gracilaria fisheri*

WAN NADILAH ADIBAH BINTI W. AHMAD

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## DEDICATION

*The thesis is special dedicated to my beloved parents,  
Hj. Wan Ahmad bin Hj. Wan Hussin and Hjh. Wan Rahani binti Hj. Yunus,  
For their never ending love and who always pray for  
my success and guided me through life.*

*To my dear husband, Mohd Firdaus bin Hj. Nawi and my family,  
Wan Noorkhaizan, Wan Mohd Norazam, Wan Amirul Amin, Wan Najwa Arifah,  
Wan Afifah Mardhiah, Wan Najiah Bahirah and Wan Haspinah binti W. Hussin,  
Also unforgettable to my father and mother-in-law,  
Hj. Nawi bin Hj. Abdullah and Hjh. Norjan binti Abdullah,  
Thank you for supporting my aspirations with love encouragement, endurance  
patience and belief on me.*

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Nur Suraya Abdullah, Zarina Abdul Razak and Masita Mohammad,  
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**NUTRITIONAL VALUE OF THE RED SEAWEED, *Gracilaria fisheri***

**WAN NADILAH ADIBAH BINTI W. AHMAD**

**January 2010**

**Chairperson : Siti Aishah Abdullah @ Christine A. Orosko, Ph.D**

**Members : Professor Awang Soh Mamat, Ph.D  
Zainudin Bachok, Ph.D**

**Faculty : Maritime Studies and Marine Science**

The edible red seaweed *Gracilaria fisheri* is originally from Southern Thailand and relatively popular in the border states of Kelantan and Terengganu in Malaysia. The locals prefer consuming this weed as “kerabu sarer”. However, there are no scientific reports on the nutritional value of *G. fisheri* and thus this study was carried out. The objectives were to determine the proximate composition (protein, lipid, fiber, ash, moisture and carbohydrate), fatty acids (FAs) composition, amino acid composition and mineral elements content of *G. fisheri*. The samples were obtained from selected markets in Pasir Puteh, Kota Bharu and Jelawat in Kelantan. The experiments were carried out in triplicates for all the nutrient parameters.

The results showed that *G. fisheri* from Pasir Puteh, Kota Bharu and Jelawat in Kelantan had high content of ash (average: 43-46% of dry weight) and fibre (average: 13-23% of dry weight) and also moderate concentrations of carbohydrate (average: 38-40% of dry weight) and protein (average: 15-24% of dry weight). However, crude lipid concentration in *G. fisheri* was low (average: 0.4-2% of dry

weight). In this study, the most dominant fatty acid was 16:0 (palmatic acid), 10.1-20.1%. There were two most important groups of PUFAs: omega-3 (7.0-13.1%) and omega-6 (9.8-16.6%). Furthermore, *G. fisheri* also contained essential PUFAs such as eicosapentaenoic acid (EPA, 20:5 $\omega$ 3), (1.1-2.1%), docosahexaenoic acid (DHA, 22:6 $\omega$ 3), (0.8-2.5%), docosapentaenoic acid (DPA, 22:5 $\omega$ 3), (3.2%), linoleic acid (LA, 18:2 $\omega$ 6), (2.4-4.5%) and alpha-linolenic acid (ALA, 18:3 $\omega$ 3), (2.3-5.7%). In *G. fisheri*, 17 essential and non-essential amino acids were detected. The concentration of total amino acid was not significantly different among those three locations with a range of 0.2 to 1.8%. Aspartic acid had the highest concentration in *G. fisheri* found in all locations, (1.6-1.8%). Meanwhile, glutamic acid (1.5-1.8%) and leucine (1.0-1.2%) were in lower concentrations as compared to aspartic acid. Although lysine content is not very high in *G. fisheri* (0.6-0.7%), it contributes potential nutrient supplement for animals. As for mineral elements, the mean concentration also did not show significant differences among the three locations. The most abundant macroelements were calcium (11.2-12.2%) and potassium (7.9-9.0%) while the microelements were manganese (8.8-9.8%) and iron (5.4-7.3%). Meanwhile, the heavy metal contents, Cd (0.1-1.0 $\mu$ g/g) and Pb (0.2-0.7 $\mu$ g/g) were reported under safely level (Cd,<3 $\mu$ g/g and Pb,<10 $\mu$ g/g) for direct human food consumption. Thus with all nutrients found in this study, *G. fisheri* can be recommended as food supplement for human to balance their daily mineral intake. In summary, *G. fisheri* met with the safety consumer regulations of RDA (Recommended Dietary Allowance), USDA. The current findings also suggest that *G. fisheri* is a suitable food with high nutritional value, either as raw or semi processed material for human consumption.

Abstrak tesis ini dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk ijazah Sarjana Sains

**NILAI NUTRISI PADA RUMPAI LAUT MERAH, *Gracilaria fisheri***

**WAN NADILAH ADIBAH BINTI W. AHMAD**

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**Pengerusi : Siti Aishah Abdullah @ Christine A. Orosko, Ph.D**  
**Ahli : Profesor Awang Soh Mamat, Ph.D**  
**Zainudin Bachok, Ph.D**  
**Fakulti : Pengajian Maritim dan Sains Marin**

Rumpai laut merah *Gracilaria fisheri* yang boleh dimakan ini adalah berasal dari selatan Thailand dan popular di sempadan daerah Kelantan dan Terengganu di Malaysia. Penduduk tempatan lebih mengenali rumpai ini sebagai “kerabu sarer”. Walaubagaimanapun, tiada kajian saintifik dilaporkan ke atas nilai nutrisi pada *G. fisheri*. Oleh sebab itu, kajian ini telah dibuat. Objektif-objektif dalam kajian ini adalah untuk menentukan anggaran komposisi (protein, lemak, fiber, abu, kelembapan dan karbohidrat), komposisi asid lemak, komposisi asid amino dan kandungan elemen mineral di dalam *G. fisheri*. Sampel-sampel adalah diperolehi daripada pasar terpilih di Pasir Puteh, Kota Bharu dan Jelawat di Kelantan. Eksperimen ini telah diulang sebanyak tiga kali bagi semua parameter nutrien yang telah ditetapkan.

Keputusan kajian menunjukkan bahawa *G. fisheri* daripada Pasir Puteh, Kota Bharu dan Jelawat di Kelantan mengandungi kandungan abu yang tinggi (purata: 43-46% berat kering) and fiber (purata: 13-23% berat kering) dan juga kandungan

karbohidrat yang sederhana (purata: 38-40% berat kering) dan kandungan protein (purata: 15-24% berat kering). Walaubagaimanapun, kandungan lipid kasar di dalam *G. fisheri* adalah rendah (0.4-2% berat kering). Dalam kajian ini, kandungan asid lemak yang paling tinggi adalah 16:0 (asid palmatik), 10.1-20.1%. Terdapat dua kumpulan yang paling penting di dalam PUFAs iaitu omega-3 (7.0-13.1%) dan omega-6 (9.8-16.6%). Di samping itu, *G. fisheri* juga mengandungi PUFAs perlu seperti “eicosapentaenoic acid” (EPA, 20:5 $\omega$ 3), (1.1-2.1%), “docosahexaenoic acid” (DHA, 22:6 $\omega$ 3), (0.8-2.5%), “docosapentaenoic acid” (DPA, 22:5 $\omega$ 3), (3.2%), “linoleic acid” (LA, 18:2 $\omega$ 6), (2.4-4.5%) dan “alpha-linolenic acid” (ALA, 18:3 $\omega$ 3), (2.3-5.7%). Dalam *G. fisheri*, 17 asid amino perlu dan asid amino tidak perlu telah dikesan. Jumlah kandungan asid amino tidak menunjukkan perbezaan yang ketara di antara semua lokasi di dalam julat 0.2% hingga 1.8%. Asid aspartik dilaporkan mempunyai kandungan yang paling tinggi di dalam *G. fisheri* di semua lokasi (1.6-1.8%). Manakala asid glutamik (1.5-1.8%) dan “leucine” (1.0-1.2%) adalah yang paling rendah dilaporkan di semua lokasi. Walaupun kandungan “lysine” dilaporkan tidak terlalu tinggi di dalam *G. fisheri* (0.6-0.7%), tetapi “lysine” menyumbang potensi sebagai nutrien tambahan untuk haiwan. Sebagai sumber untuk elemen mineral, nilai purata kandungan tidak menunjukkan perbezaan yang ketara di tiga lokasi. Kandungan makroelemen yang paling tinggi adalah kalsium (11.2-12.2%) dan potasium (7.9-9.0%) manakala untuk mikroelemen adalah mangan (8.8-9.8%) dan besi (5.4-7.3%). Selain itu bagi kandungan logam berat iaitu “cadmium” (0.1-1.0 $\mu$ g/g) dan plumbum (0.2-0.7 $\mu$ g/g) adalah dilaporkan di bawah tahap selamat (Cd,<3 $\mu$ g/g dan Pb,<10 $\mu$ g/g) sebagai makanan untuk manusia. Oleh itu, *G. fisheri* boleh disyorkan sebagai makanan tambahan manusia untuk mengimbangi pengambilan mineral harian.



Kesimpulannya, *G. fisheri* telah memenuhi peraturan keselamatan pengguna dari RDA (Recommended Dietary Allowance), USDA. Penemuan terkini ini juga telah mencadangkan *G. fisheri* adalah makanan tinggi kandungan nutrisi yang sesuai untuk manusia sama ada dimakan mentah ataupun separa masak.