

ISOLATION AND DETERMINATION OF CHEMICAL
COMPOUNDS FROM RED ALGAE, *Gracilaria manilaensis*,
Gracilaria sp. AND *G. ohangii* AND THEIR BIOACTIVITIES

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MASTER OF SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

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Perpustakaan Sultanah Nur Zahirah
Universiti Malaysia Terengganu (UMT)



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Isolation and determination of chemical compounds from red algae, *Gracilaria manilaensis gracilaria* sp. and *G. changii* and their bioactivities / Desy Fitrya Syamsurir.

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manilaensis, *Gracilaria* sp. AND *G. changii* AND THEIR
BIOACTIVITIES

DESY FITRYA BINTI SYAMSUMIR

Thesis Submitted in Fulfillment of the Requirement for the Degree
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Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu
in fulfillment of the requirements for the degree of Master of Science

ISOLATION AND DETERMINATION OF CHEMICAL COMPOUNDS FROM
RED ALGAE, *Gracilaria menispermis*, *Gracilaria* sp. AND *G. changii* AND
THEIR BIOACTIVITIES

DESY FITRYA BINTI SYAMSUMIR

December 2008

Chairperson: Dr. Habsan Mohamed, Ph.D.

Member : Professor Dr. Abdul Manaf Ail, PhD.
Professor Dr. Norsaadah Abdul Rahman, PhD.
Professor Dr. Faizah Shaharom, PhD.

Faculty : Science and Technology

Five species from Gracilariaceae, one Ulvaceae and one Scytosiphonaceae,

two *Gracilaria* species were selected and their chemical constituents
were screened for their antioxidant (DPPH

free radical scavenging assay, xanthine oxidase inhibitory assay and total
phenolic content assay), antibacterial (disc diffusion method) and

acetylcholinesterase inhibitory assay (TLC bioautographic method). Three
species of Gracilariaceae were selected for further isolation due to the high

quality yields available and preliminary screening of biological activities on
these aspects. Three compounds were successfully isolated in this study.

namely vitamin B-12 isolated from *Gracilaria menispermis*, *Gracilaria* sp.
and *G. changii*, hexadecanoic acid from *G. menispermis* and *G. changii* and 1-

3-(2-hydroxyphenyl)-3-(2',4',6'-trihydroxyphenyl)-3-hydroxypropanone from
Gracilaria sp. The structures of these compounds were determined based on

spectral data analysis and comparison with literature review. Polysaccharides

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DESY FITRYA BINTI SYAMSUMIR

December 2008

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Five species from Gracilariaceae, one Ulvaceae and one Scytosiphonaceae, two polysaccharides from *Gracilaria* spp. and three cholesterol derivatives were screened for their cytotoxicity (MTT assay method), antioxidant (DPPH free radical scavenging assay, xanthine oxidase inhibitory assay and total phenolic content assay), antibacterial (disc diffusion method) and acetylcholinesterase inhibitory assay (TLC bioautographic method). Three species of Gracilariaceae were selected for further isolation due to the high quantity sample available and preliminary screening of biological activities on crude extracts. Three compounds were successfully isolated in this study, namely cholest-5-en-3-ol isolated from *Gracilaria manilaensis*, *Gracilaria* sp. and *G. changii*; hexadecanoic acid from *G. manilaensis* and *G. changii*; and 1-(4'-methoxyphenyl)-3-(2'',4'',6''-trihydroxyphenyl)-3-hydroxypropanone from *Gracilaria* sp. The structures of these compounds were determined based on spectral data analysis and comparison with literature review. Polysaccharides

were isolated from *G. manilaensis* and *Gracilaria* sp.. Polysaccharides obtained were identified as agar type polysaccharide by comparison to the IR spectrum with literature.

Diethyl ether and butanol crude extracts of *Gracilaria* sp. showed the most prominent total phenolic content compared to others and all methanolic crude extract tested in this study demonstrated positive activity of AChE inhibitory activity. Cholest-5-en-3-ol and hexadecanoic acid were found to be cytotoxic against HL-60 and MCF-7 cell lines. 1-(4'-methoxyphenyl)-3-(2",4",6"-trihydroxyphenyl)-3- hydroxypropanone showed high antioxidant activity for DPPH free radical scavenging and xanthine oxidase inhibitory plus promising antibacterial activity with the inhibition zone ≥ 8 mm (\emptyset). Hexadecanoic acid also showed inhibition against acetylcholinesterase enzyme with minimum inhibition dose 1.25 μ g of sample. Polysaccharide from *G. manilaensis* revealed weak cytotoxic activity towards HL-60 cell lines. Both polysaccharides isolated showed very low activity of DPPH free radical scavenging and xanthine oxidase inhibitory while they were inactive against antibacterial test.

Three cholesterol derivatives were synthesized, cholest-4-en-3,6-diones, cholestan-3-one and cholest-4-en-3-one. Cholest-4-en-3,6-diones and cholest-4-en-3-one showed strong cytotoxic activity with IC_{50} in range 0.30 ± 0.03 μ g/mL to 3.20 ± 0.42 μ g/mL while cholestan-3-one showed moderate activity with IC_{50} value 10.60 ± 1.05 μ g/mL and 14.50 ± 0.86 μ g/mL towards HL-60 and MCF-7 cell lines respectively. Cholestane-3-one and cholest-4-en-

3-one demonstrated antibacterial activity with inhibition zone $\leq 10.00 \pm 0.00$ against *S. agalatea* and *E. coli*. All synthetic compounds showed low antioxidant activity for DPPH free radical scavenging and xanthine oxidase inhibitory.

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lima species daripada Gracilariaceae, satu Ulvaceae dan satu Scytosiphonaceae, dua polisakarida daripada *Gracilaria* spp. dan tiga terbitan kolesterol telah diuji untuk menentukan aktiviti teroksikatif (keadaah MTT), anoksida (pemerangkapan radikal bebas oleh DPPH), perencatan enzim xanthin oksidase dan kandungan sebatian fenolik, antibakteria (keadaah pembauran cakera) dan pemerancatan enzim basilikofinesterase (keadaah bioautografi KLN). Tiga species Gracilariaceae telah dipilih untuk pemencilan selanjutnya berdasarkan oleh kuantiti sampel yang banyak didapati dan kajian aktiviti biologi ke atas ekstrak mentah tersebut. Tiga sebatian benzoyl dipencilkan di dalam kajian ini, ialah 5-*oxo-3- α - β -D* dipencilkan daripada *Gracilaria manihensis*, *Gracilaria* sp. and *G. diardi*; asid heksahidroksipolipid daripada *G. manihensis* and *G. diardi*; dan 1-(4-metoksifenil)-3-(2',4',6'-trihidroksifenil)-3-hidroksipropanon daripada *Gracilaria* sp. Struktur sebatian-sebatian tersebut ditentukan berdasarkan data analisis spektroskopi dan perbandingan