

THE EFFECTS OF AMMONIUM-NITROGEN CONCENTRATION ON THE
RATES OF GROWTH, PHOTOSYNTHESIS AND AMMONIUM-NITROGEN
UPTAKE OF *Gracilaria edulis* (RHODOPHYTA) UNDER
DIFFERENT LIGHT CONDITIONS

SOON CHIN KAI

FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITI PUTRA MALAYSIA
TERENGGANU
1999

**THE EFFECTS OF AMMONIUM-NITROGEN
CONCENTRATION ON THE RATES OF GROWTH,
PHOTOSYNTHESIS AND AMMONIUM-NITROGEN
UPTAKE OF *Gracilaria edulis* (RHODOPHYTA)
UNDER DIFFERENT LIGHT CONDITIONS**

BY

SOON CHIN KAI

**This project report is submitted in partial fulfilment of
the requirements for the Degree of
Bachelor of Fisheries Science**

**FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITY PUTRA MALAYSIA TERENGGANU**

1999

1100024172

Specially dedicated to

Dad & Mom

*For your unconditional love and
sacrifice.*

I love you both

ACKNOWLEDGEMENTS

I would like to extend my sincere appreciation and gratitude to my first supervisor, Dr. Siti Aishah @ Christine A. Orosco and my second supervisor, Prof. Dr. Law Ah Theem for their guidance, advice, comments, patience, kindness and time throughout this year. Truly, without their help and supervision this project would not have been possible.

I would also like to thank Institut Pendidikan Perikanan, Penang officer, Mr. Ramli Saad, and his assistant, Mr. Marzuki Omar for providing me a place to do my practical for my final year project. Special thanks also go out to Mr. Chan, Mr. Teoh, Mr. Lim, Mr. Haw Weng Cheong, Mr. Hoe See Ean, Miss Ting Wei Chin, Mr. Wai Kean Tat, Miss Koay Chew Yit, Miss Lau Cheng Cheng and Miss Tan Sin Lee for their generosity in time to help me in this project.

My deepest gratitude goes out to my dad, mom and brother, Soon Chin Chong for their endless love and moral support during my days in the university.

Last but not least, I would like to express my heartfelt thanks to all my friends who tolerated my craziness and gave me emotional support throughout this project. Thank you for all your prayer support, concern and for making me smile and laugh during this period of time. You will be remembered for what you have done.

May God bless all of you.

ABSTRACT

This study was carried out in order to understand more about the physiology of *Gracilaria edulis*. In this study, (i) ammonium-nitrogen uptake rate (ii) gross photosynthetic rate, net photosynthetic rate and respiration rate and (iii) growth rate were determined in relation to ammonium-nitrogen concentration, culture period, and light condition.

Gracilaria edulis (12 g fresh weight) were cultured in 3 liter plastic tanks with 2 liter of seawater incubation medium. Three ammonium enrichment concentrations, 0.5 ppm, 1.0 ppm and 1.5 ppm, were used for this experiment at the beginning, after 1 week and after 2 weeks of incubation. This experiment was done under three light conditions, which are normal day length, total light and total darkness.

The experiment showed that most of the results are significant only on day 2. The results on day 8 and day 14 were inconsistent due to the toxicity. Ammonium uptake rate under total light condition was the best among all three conditions, which increase when ammonium concentrations increase from day 2 to day 14. Gross photosynthetic rate was increased with ammonium concentration on day 2 under normal day length condition, day 2 and day 8 under total light condition and inconsistent under total darkness condition. Net photosynthetic rate was almost the same under normal day length condition, decreasing from day 2 to day 14 under total light condition and more of the results were negative under total darkness condition. Growth rate decreased from day 2 to day 14 under all conditions.

ABSTRAK

Kajian ini telah dijalankan untuk memahami dengan lebih mendalam mengenai fisiologi *Gracilaria edulis*. Daripada kajian ini, (i) kadar penyerapan ammonium-nitrogen (ii) kadar fotosintesis kasar, kadar fotosintesis bersih dan kadar respirasi (iii) kadar tumbesaran telah ditentukan berkenaan dengan kepekatan ammonium-nitrogen, jangka masa mengkultur dan keadaan cahaya.

Gracilaria edulis (12g berat bersih) telah dikultur dalam tangki akuarium plastik 3 liter dengan 2 liter air laut sebagai medium rendaman. Tiga jenis kepekatan ammonium diperkaya, 0.5 ppm, 1.0 ppm dan 1.5 ppm, telah digunakan untuk eksperimen ini pada permulaan, selepas 1 minggu dan selepas 2 minggu. Eksperimen telah dilakukan di bawah tiga keadaan, iaitu keadaan biasa, keadaan terang sepenuhnya dan keadaan gelap sepenuhnya.

Eksperimen ini menunjukkan bahawa kebanyakan keputusan yang didapati adalah nyata pada hari ke-2. Keputusan pada hari ke-8 dan hari ke-14 adalah tidak stabil disebabkan oleh toksisiti. Kadar penyerapan ammonium di bawah keadaan terang sepenuhnya adalah paling baik di antara ketiga-tiga keadaan ini, iaitu kadar penyerapan bertambah dengan kepekatan ammonium dari hari ke-2 hingga hari ke-8. Kadar fotosintesis kasar hanya bertambah dengan kepekatan ammonium pada hari ke-2 di bawah keadaan biasa, hari ke-2 dan hari ke-8 di bawah keadaan terang sepenuhnya dan tidak stabil di bawah keadaan gelap sepenuhnya. Kadar fotosintesis bersih adalah lebih kurang sama di bawah keadaan biasa, berkurangan dari hari ke-2 hingga hari ke-14 di bawah keadaan terang sepenuhnya dan kebanyakannya adalah negatif di bawah

keadaan gelap sepenuh.Kadar tumbesaran menjadi kurang dari hari ke-2 ke hari ke-14
untuk semua keadaan.