ISOLATION AND CHARACTERIZATION OF PROTEOLYTIC ENZYMES FROM SALT-TOLERANT AND THERMOPHILIC BACTERIA FOR APPLICATION IN FOOD INDUSTRY

SOMKID DEEJING

DOCTOR OF PHILOSOPHY
IN BIOTECHNOLOGY

adansuranentalistalku Copyright © by Chiang Mai University All right GRADUATE SCHOOLS erved

CHIANG MAI UNIVERSITY
DECEMBER 2004
ISBN 974-9882-08-3

ISOLATION AND CHARACTERIZATION OF PROTEOLYTIC ENZYMES FROM SALT-TOLERANT AND THERMOPHILIC BACTERIA FOR APPLICATION IN FOOD INDUSTRY

SOMKID DEEJING

A THESIS SUBMITTED TO THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN BIOTECHNOLOGY

Copyright C by Chiang Mai University

A I I r i g h GRADUATE SCHOOL S e r v e d

CHIANG MAI UNIVERSITY

DECEMBER 2004

ISBN 974-9882-08-3

ISOLATION AND CHARACTERIZATION OF PROTEOLYTIC ENZYMES FROM SALT-TOLERANT AND THERMOPHILIC BACTERIA FOR APPLICATION IN FOOD INDUSTRY

SOMKID DEEJING

THIS THESIS HAS BEEN APPROVED TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN BIOTECHNOLOGY

| EXAMINING COMMITTEE | |
|---|-------------|
| Lawaman Lunyong | CHAIRPERSON |
| Assoc. Prof. Dr. Saisamorn Lumyong | |
| Varjatut Rosavan | MEMBER |
| Assoc. Prof. Dr. Naiyatat Poosaran | |
| Sympole Chaint | MEMBER |
| Assoc. Prof. Dr.Griangsak Chairote | |
| La Mariguel | MEMBER |
| Prof. Dr. Mitsuaki Moriguchi | |
| Sittoin Bornsom but Asst. Prof. Dr. Sittisin Bovonsombut | MEMBER |
| | |

21 December 2004 © Copyright by Chiang Mai University

ACKNOWLEDGEMENT

The author would like to express my appreciation to all the individuals who have influenced the events in my life and have contributed to my scientific accomplishments. The author wish to express my sincere thanks to Assoc. Prof. Dr. Saisamorn Lumyong for her kind guidance, valuable advice and encouragement throughout the course of this study. The author also greatly indebted to Assoc. Prof. Dr. Naiyatat Poosaran and Assoc. Prof. Dr. Griangsak Chairote for his excellent comments and helpful suggestions in this work. The author would like to thank examining members, Asst. Prof. Dr. Sittisin Bovonsombut for his guidance and valuable suggestion.

It is a great pleasure to acknowledge the valuable advice and kind help by Prof. Dr. Mitsuaki Moriguchi, Professor of Oita University. The author also wish to thank Dr. Kazuaki Yoshimune and all the members of Department of Chemistry, Faculty of Engineering, Oita University, Japan both past and present, for sharing ideas with me and countless other things they have done for me.

Special thanks to Japanese government (Monbusho) scholarship, UDC scholarship, Diversity Program, Institute for the Promotion of Teaching Science and Technology and Graduate School Foundation of Chiang Mai University for financial support of my study. The author also to thanks the Department of Biology, Faculty of Science, Chiang Mai University and Maejo University for the use of equipment and facilities.

Finally, the author wish to express my heartfelt thanks appreciation to my family, my father, mother and sisters as well as my friends in Department of Biology, Maejo University for their mental support throughout this study. Without their love and patience, I could have never reached completion of my study in Thailand and Japan.