Goodness portion of the present thesis is dedicated for my parents and the entire teaching staffs

ACKNOWLEDGEMENTS

I would like to express my gratitude to my advisor, Assoc. Prof. Dr. Pornthap Thanonkeo for his kindness, valuable supervision, stimulating suggestions, supporting, encouragement, guidance and criticism throughout the course of research.

I would like to thank my thesis examination committee, Assoc. Prof. Dr. Pattana Laopaiboon, Dr. Jiraphat Pechsom and Dr. Sudarat Thanonkeo for their suggestions and comments on this thesis.

I would like to express my gratitude to all staffs of the Department of Biotechnology for their kind and help during the course of this study. I wish to thank my colleagues for their friendliness and willingness to help. I would like to thank Nawapote Keeratirakha, Kanokpat Nganwongwai, Subin Srivichai, Nuntipa Khumkarjorn, Likit Sirisantimethakom, Sunan nuanpeng, and Kitipong Wechgama, for their helps and supports.

I appreciatively acknowledge the important contributions made by program of Strategic Scholarships for Frontier Research Network for the Ph.D. Program Thai Doctoral degree from the Office of the Higher Education Commission, Thailand, the National Research Council of Thailand (NRCT), the Fermentation Research Center for Value Added Agricultural Products (FerVAAP), Khon Kaen University and the Graduate School, Khon Kaen University.

Finally, I would like to express my sincere gratitude and appreciation to my dear parents and also the members of my family for their love, pushing up, cheerfulness, devoting and encouragement throughout my life.

Kanlayani Charoensopharat