CHEMICAL CONSTITUENTS AND BIOACTIVITY OF SOME *OPHIORRHIZA* SPECIES

NICHAKAN PHOOWIANG

MASTER OF SCIENCE
IN PHARMACEUTICAL SCIENCES

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่ Copyright[©] by Chiang Mai University All rights reserved

THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
SEPTEMBER 2009

CHEMICAL CONSTITUENTS AND BIOACTIVITY OF SOME *OPHIORRHIZA* SPECIES

NICHAKAN PHOOWIANG

A THESIS SUBMITTED TO THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE
IN PHARMACEUTICAL SCIENCES

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่ Copyright[©] by Chiang Mai University All rights reserved

THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
SEPTEMBER 2009

CHEMICAL CONSTITUENT AND BIOACTIVITY OF SOME OPHIORRHIZA SPECIES

NICHAKAN PHOOWIANG

THIS THESIS HAS BEEN APPROVED

TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF MASTER OF SCIENCE

IN PHARMACEUTICAL SCIENCES

Dammery Santiasworn B. Lianmany Member Assoc. Prof. Dr. Boomsom Liawruangrath Member CHAIRPERSON CHAIRPERSON CHAIRPERSON MEMBER Assoc. Prof. Dr. Dammrong Santiarworn MEMBER

28 September 2009

© Copyright by Chiang Mai University

ACKNOWLEDGEMENTS

I am very grateful to my supervisor, Assistant Professor Dr. Dammrong Santiarworn and co-supervisors, Associate Professor Dr. Boomsom Liawruangrath, Department of Pharmaceutical Science, Faculty of Pharmacy, Chiang Mai University, Thailand and Professor Dr. Hiromitsu Takayama Graduate School of Pharmaceutical Science, Chiba, University, for encouragement and intensively help and advice.

I am very grateful to Dr. Theeraphan Machan School of Science Mae Fah Luang University, Tambon Tasud, Amphur Muang, Chiang Rai Province. Thailand, the thesis committee, for valuable suggestions and corrections.

I would like to thank Faculty of Pharmacy Chiang Mai University for granting my partial financial support to conduct this research.

I would like to thank Mr. Bunyong Kantawa, Microbiology Section, Central Laboratory, Maharaj Nakorn Chiang Mai Hospital, Chiang Mai, Thailand for antimicrobial determination.

I would like to give my sincere thank to the following people who extended their kind aid in completing this work: Assoc. Prof. Dr. Saisunee Liawruangrath, Department of Chemistry, Faculty of Sciences, Chiang Mai University, Thailand for valuable advice suggestions. Mr. J.F. Maxwell CMU Herbarium, Department of Biology, Faculty of Science, Chiang Mai University, Mr. Prachya Srisanga, Herbarium official at Queen Sirikit Botanic garden, Amphur Mae Rim, Chiang Mai Province, Mr. Tawach Katpab and Mr. Jaturong Apipongpisan, Doitung official, The Mae Fah Luang Foundationunder Royal Patronage, Amphur Mae Fah Luang, Chiang Rai Prowice, Thialand for help in the plants collection and authenticated.

Finally, I sincerely appreciate Mr. Prapart Phoowiang and my parents, all my teachers and friends for their love, advice, and encouragement throughout this study.