TABLE OF CONTENT

a18191 a	Page
ACKNOWLEDGEMENT	iii
ABSTRACT IN ENGLISH	iv
ABSTRACT IN THAI	v
LIST OF TABLES	ix
LIST OF FIGURES	Х
ABBREVIATIONS AND SYMBOLS	xi
CHAPTER 1 INTRODUCTION	
1.1 Lactic Acid Bacteria (LAB)	1
1.2 Objectives	2
CHAPTER 2 LITERATURE REVIEW	
2.1 General Introduction	3
2.2 Classification of Lactic Acid Bacteria	4
2.2.1 Classification at the Genus Level	6
2.2.2 Classification at the Species Level	10
2.3 Phylogeny of the LAB	15
2.4 New tools for classification and identification	16
2.5 Antimicrobial components from LAB	18
adans 12.6 Bacteriocins 213 216 Bacteriocins	22
2.7 Nisin-structure	37
2.8 Using bacteriocins to improve food safety	S 39
All rights reserv	e d

CHAPTER 3 MATERIAL AND METHODS	
3.1 Materials	43
3.1.1 Chemical Reagents	43
3.1.2 Equipments	43
3.1.3 Fermented Vegetable and Fruit products	43
3.1.4 Indicator microorganisms	44
3.2 Methods	45
3.2.1 Indicator microorganism culture	45
3.2.2 Isolation of lactic acid bacteria	45
3.2.3 Isolation of antimicrobial substance	46
producing LAB from Fermented Vegetable	
and Fruit products	
3.2.3.1 Pretest by paperdisc diffusion	46
method	
3.2.3.2 Confirm test by agar well diffusion	47
Method	
3.2.4 Acid and bile Tolerance test	48
3.2.5 Biochemical characters	48
3.2.6 16S-rRNA gene analysis	
3.2.6.1 DNA Extraction	49
3.2.6.2 Amplification of 16S rRNA gene	51
3.2.6.3 Sequencing of 16s-rRNA gene and	51
Copyright ^C by Chia phylogenetic tree gene analysis	sity
All rights reserve	3 C

CHAPTER 4 RESULTS AND DISCUSSION	
4.1 Isolation of lactic acid bacteria	52
4.2 Screening of antimicrobial substance producing	58
LAB.	
4.3 Selection of antimicrobial substance producing LAB	58
4.4 Determination of antimicrobial substance	59
4.5 Determination of bacteriocin producing LAB	60
4.6 Acid Tolerance	66
4.7 Bile Tolerance	67
4.8 Physiologycal characterization of bacteriocin producing LAB	73
4.9 Identification by 16S-rRNA gene analysis	75
4.9.1 Amplification of 16S-rRNA gene	75
4.9.2 16s-rRNA Gene analysis	76
CHAPTER 5 CONCLUSIONS	79
REFERENCES	81
APPENDIX A	104
APPENDIX B	108
APPENDIX C	109
CIRRICULUM VITAE	111
ลิขสิทธิ์มหาวิทยาลัยเชียงไห	í J
Copyright [©] by Chiang Mai Univers	ity
All rights reserve	d

viii

Page

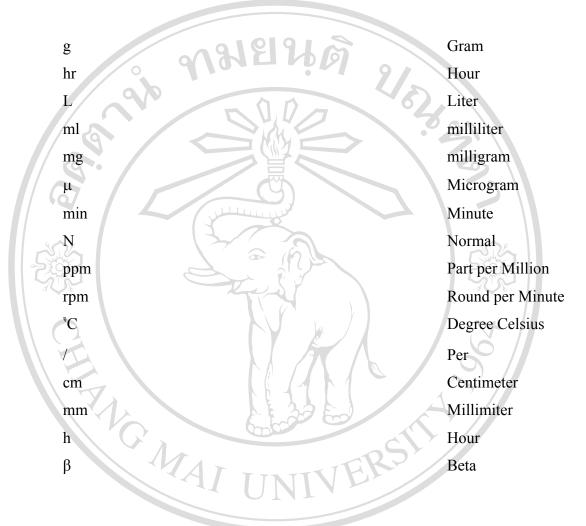
LIST OF TABLES

Table	Page
2.1 Differential Characteristic of LAB	9
2.2 Arrangement of the Genus Lactobacillus	14
2.3 Classes of bacteriocins produced by LAB	24
2.4 Lanthionine-Containing Bacteriocins produced by LAB (Class I)	25
2.5 Class II Bacteriocins	29
2.6 Class III Bacteriocins	36
2.7 Complex Bacteriocin (Class IV)	37
3.1 Ten kind of Northern of Thai fermented vegetable and Fruit products	44
3.2 DNA extraction for laction for lactic acid bacteria	50
4.1 Inhibition of two indicator microorganism by antimicrobial substance	53
4.2 Inhibition of three indicator microorganism by antimicrobial substance	54
4.3 Inhibition of four indicator microorganism by antimicrobial substance	55
4.4 Screening of bacteriocin from antimicrobial substance producing LAB	61
4.5 Acid Tolerance	67
4.6 Bile Tolerance	68
4.7 Biochemical characters of three isolates from fermented vegetable and from products.	uit 73
opyright [©] by Chiang Mai Unive	rsit
il rights reserv	

LIST OF FIGURES

Figure ABIELS P	Page
2.1 A schematic representation of the mode of action of nisin	39
2.2 Bacteriocins can be incorporated directly into fermented foods	42
4.1 Bacteriocin property of FC4-01/1 on the inhibition of 4 indicator	62
Microorganism	
4.2 Bacteriocin property of FC4-01/4 on the inhibition of 4 indicator	64
Microorganism	
4.3 Bacteriocin property of FC6-01/2 on the inhibition of 4 indicator	65
4.4 Acid tolerance of FC4-01/1, FC4-01/4 and FC6-01/2	69
4.5 Bile Tolerance of FC4-01/1	70
4.6 Bile Tolerance of FC4-01/4	71
4.7 Bile Tolerance of FC6-01/2	72
4.8 Cell Morphology of isolates FC4-01/1, FC4-01/4, FC6-01/2	74
4.9 Agarose gel electrophoresis of DNA	76
4.10 Phylogenetic tree of isolates FC6-01/2 (EU835754),	77
FC4-01/1 (EU835755), FC4-01/4 (EU835756).Based on the near	2
full length sequence of 16S-rRNA genes. Numbers in	<u> UINI</u>
parenthesis are the accession numbers of 16S-rRNA gene sequences in nucleotide databases.	versity
All rights reser	vec

ABBREVIATIONS AND SYMBOLS



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