

ACKNOWLEDGEMENTS

Praise to the Lord Jesus Christ for because of His blessings and grace, the author was able to accomplish the completion of this thesis, which entitled “THE APPLICATION OF FOAM MAT DRYING IN THE PRODUCTION OF GREEN KIWI FRUIT BEVERAGE POWDER”. This thesis was written as final requirement to attain degree of *Sarjana Teknologi Pertanian Strata Satu*, Food Technology Department, Faculty of Science and Technology, University of Pelita Harapan, Tangerang.

This thesis report could not be completed without the help and support from many parties. Therefore, the author would like to gratitude to those who have support and help during the completion of this final project. The author sincerely would like to utter gratitude to:

1. Eric Jobiliong, Ph.D, Dean of Faculty of Science and Technology
2. Ir. W. Donald R. Pokatong, M.Sc., Ph.D., as Head of Food Technology Study Program who had guided, help and support during study in Universitas Pelita Harapan.
3. Dr.-Ing Azis Boing Sitanggang, S.TP, MSc., as thesis supervisor, who has guided, supported, given useful inputs and time during the completion of this final project.
4. Intan Cidarbulan Matita, Ph.D., as thesis co-supervisor, who has guided, supported, given useful inputs and time during the completion of this final project.
5. Tagor M. Siregar, MS, Dr. A. Parhusip, Natania, M. Eng, Yuniwaty Halim, MSc, as the Head of Chemistry, Microbiology, Food Processing, Quality Control, and Research Laboratory who had given permission to the writer to conduct the research in the laboratories.
6. Mateus Andra S.TP, Virly S.TP, Mr. Darius, Mr. Yosafat, Mr. Adi and Mr. Adzie for the guidance and support during the research in the laboratories.
7. All the lecturers, assistant lecturers and staffs in Food Technology Department of Universitas Pelita Harapan for the support and help to author.

8. Beloved family including father (Lukas Liemanto), mother (Ratna Mulyati), elder brother (Lukas Kevin Liemanto) and little sister (Karyn Luna Liemanto) for the love, care, prayers and unending support during good and hard times.
9. Reynold Setiawan Halim, for the love, prayers and support throughout author's research.
10. Novini Gunario, Sicilia Chandra Wijaya, Karina Indriani Mardjuki, Andrea Christy, Novelia Gunario, Angga Eka Sugato, Kenny Wijaya, Febrico, Evelin Feby Susanto, William Hardjo, Lidya Evania Lukito, Maria Regina and Marshella Chandra for the togetherness, laugh and tears, ups and downs and all moments shared during years of study in Universitas Pelita Harapan.
11. Mira Karina, Jessica, Stella Jessica and Florencia Irena as friends under same supervisor, for the support and moments shared together.
12. All other relative and friends who are not yet mentioned for the help, motivation, care and support throughout author's research.

The author realize that this thesis is far from excellence. Therefore, any critics and suggestions are welcomed for better improvement. At last, the author hopes this research would provide useful information for the readers.

Tangerang, January 31st, 2018

Writer

TABLE OF CONTENTS

	page
COVER	
STATEMENT OF THESIS AUTHENTICITY	
APPROVAL LETTER BY THESIS SUPERVISOR	
APPROVAL BY THESIS EXAMINATION COMMITTEE	
ABSTRACT.....	v
ACKNOWLEDGEMENT	vi
TABLE OF CONTENTS.....	viii
LIST OF FIGURES	xi
LIST OF TABLES.....	xii
LIST OF APPENDICES.....	xiii
CHAPTER I INTRODUCTION.....	1
1.1 Background	1
1.2 Research Problem.....	3
1.3 Objectives.....	4
1.3.1 General Objectives	4
1.3.2 Specific Objectives.....	4
CHAPTER II LITERATURE REVIEW	5
2.1 Overview of Kiwi Fruit.....	5
2.1.1 Green Fleshed Kiwi (<i>A. deliciosa</i>)	7
2.2 Basic Drying.....	8
2.3 Foam Mat Drying.....	9
2.4 Foaming Properties of Egg White.....	10
2.5 Stabilizer and Filler.....	11
CHAPTER III RESEARCH METHODOLOGY	13
3.1 Materials and Equipment	13
3.2 Research Stages.....	13
3.2.1 Preliminary Stage	13
3.2.2 Main Research Stage.....	15
3.2.2.1 Step I: Effect of concentration of CMC and maltodextrin	16
3.2.2.2 Step II: Effect of Egg albumen concentration and whipping time.....	16
3.2.2.3 Step III: Effect of drying temperature and time.....	16
3.2.3 Product Characteristics.....	17
3.3 Experimental Design.....	17
3.4 Analysis of Powder in Main Research Stage	20
3.4.1 Stability	20
3.4.2 Total Dissolved Solid	21
3.4.3 Antioxidant Capacity -DPPH	21
3.4.4 Percentage of Yield – Moisture Content	22

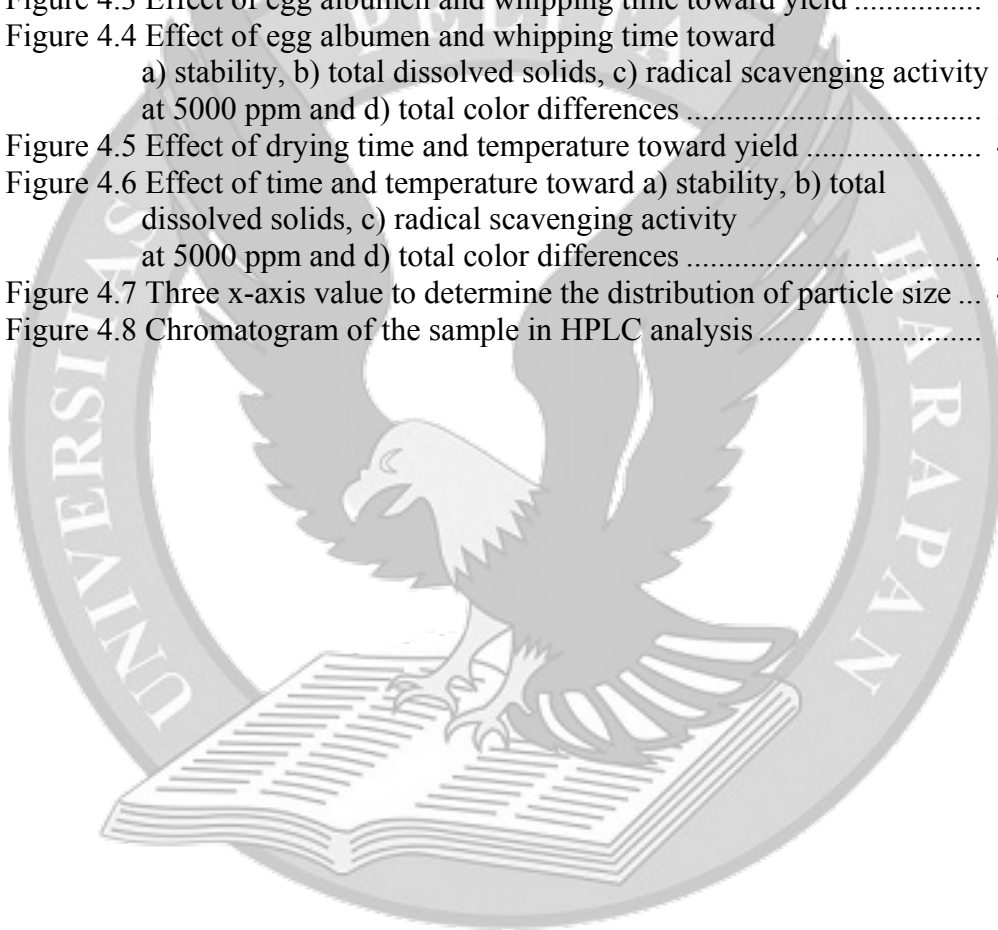
3.4.5 Total Color Differences	23
3.4.6 Additional Analysis Toward Optimum Powder	23
3.4.6.1 Gas Chromatography-Mass Spectrometry	23
3.4.6.2 Particle Size Analyzer.....	24
3.4.6.3 High Performance Liquid Chromatography ..	24
3.4.6.4 Microbial Count.....	25
3.4.6.4.1 Preparation of Sample	25
3.4.6.4.2 Coliform Analysis	25
3.4.6.4.3 <i>Escherichia Coli</i> Analysis	26
3.4.6.4.4 <i>Salmonella</i> Analysis	26
3.4.6.4.5 Total Plate Count.....	27
3.4.6.4.6 Mold and Yeast	27
CHAPTER IV RESULT AND DISCUSSION.....	28
4.1 Preliminary Stage	28
4.2 Main Research Stage.....	28
4.2.1 Effect of Carboxymethyl Cellulose and Maltodextrin towards Yield	28
4.2.2 Carboxymethyl Cellulose and Maltodextrin towards Several Parameters.....	31
4.2.2.1 Stability	32
4.2.2.2 Total Dissolved Solid	32
4.2.2.3 Radical Scavenging Activity	33
4.2.2.4 Total Color Differences	34
4.2.3 Effect of Egg Albumen and Whipping Time towards Yield	36
4.2.4 Effect of Egg Albumen and Whipping Time towards Several Parameters.....	37
4.2.4.1 Stability.....	38
4.2.4.2 Total Dissolved Solid	39
4.2.4.3 Radical Scavenging Activity	39
4.2.4.4 Total Color Differences	40
4.2.5 Effect of Egg Albumen and Whipping Time towards Yield	43
4.2.6 Effect of Egg Albumen and Whipping Time towards Several Parameters.....	44
4.2.6.1 Stability.....	45
4.2.6.2 Total Dissolved Solid	46
4.2.6.3 Radical Scavenging Activity	46
4.2.6.4 Total Color Differences	47
4.3 Product Characteristics.....	49
4.3.1 Particle Size Analysis.....	49
4.3.2 Volatile Compounds in Kiwi Powder	50
4.3.3 Vitamin C Determination	54
4.3.4 Microbial Count	56

CHAPTER V CONCLUSION AND SUGGESTIONS.....	57
5.1 Conclusion.....	58
5.2 Suggestions	59
BIBLIOGRAPHY.....	60
APPENDICES	64



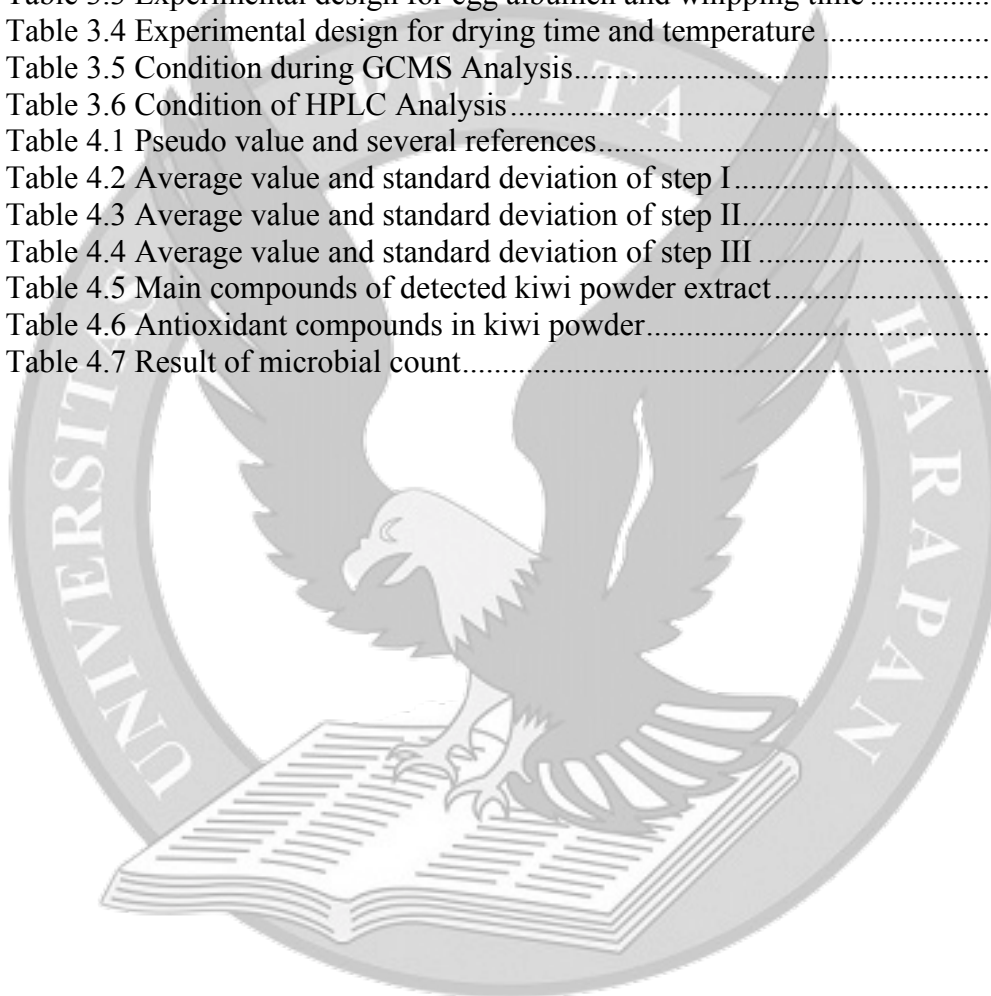
LIST OF FIGURES

	page
Figure 2.1 <i>A. deliciosa</i> on the left and <i>A. chinense</i> on the right (a), <i>A. arguta</i> (b), <i>A. kolomikta</i> (c), <i>A. Polygama</i> (d).....	6
Figure 3.1 Processing flowchart of instant powder of Kiwi fruit	14
Figure 4.1 Effect of CMC and Maltodextrine toward yield.....	29
Figure 4.2 Effect of carboxymethyl cellulose (CMC) and maltodextrin (MD) toward a) stability, b) total dissolved solids, c) radical scavenging activity at 5000 ppm and d) total color differences	31
Figure 4.3 Effect of egg albumen and whipping time toward yield	36
Figure 4.4 Effect of egg albumen and whipping time toward a) stability, b) total dissolved solids, c) radical scavenging activity at 5000 ppm and d) total color differences	38
Figure 4.5 Effect of drying time and temperature toward yield	43
Figure 4.6 Effect of time and temperature toward a) stability, b) total dissolved solids, c) radical scavenging activity at 5000 ppm and d) total color differences	45
Figure 4.7 Three x-axis value to determine the distribution of particle size ...	49
Figure 4.8 Chromatogram of the sample in HPLC analysis	55



LIST OF TABLES

	page
Table 2.1 Nutrition content of 100 gr flesh of green kiwi fruit	7
Table 3.1 References used to determine pseudo value	15
Table 3.2 Experimental design for CMC concentration and MD concentration ..	19
Table 3.3 Experimental design for egg albumen and whipping time	20
Table 3.4 Experimental design for drying time and temperature	20
Table 3.5 Condition during GCMS Analysis.....	24
Table 3.6 Condition of HPLC Analysis.....	24
Table 4.1 Pseudo value and several references.....	28
Table 4.2 Average value and standard deviation of step I.....	35
Table 4.3 Average value and standard deviation of step II.....	42
Table 4.4 Average value and standard deviation of step III	48
Table 4.5 Main compounds of detected kiwi powder extract.....	51
Table 4.6 Antioxidant compounds in kiwi powder.....	53
Table 4.7 Result of microbial count.....	56



LIST OF APPENDICES

	page
Appendix A	
Yield Analysis of Main Research Stage.....	A-1
Calculation of Yield Analysis	A-1
Data Analysis of Percentage Yield in Step I.....	A-2
Statistical Analysis of Percentage Yield in Step I.....	A-4
Data Analysis of Percentage Yield in Step II.....	A-6
Statistical Analysis of Percentage Yield in Step II.....	A-7
Data Analysis of Percentage Yield in Step III.....	A-9
Statistical Analysis of Percentage Yield in Step III.....	A-11
Appendix B	
Stability Analysis of Main Research Stage.....	B-1
Data of Stability Analysis in Step I.....	B-1
Statistical Analysis of Stability in step I.....	B-3
Data Analysis of Stability in Step II.....	B-6
Statistical Analysis of Stability in Step II.....	B-8
Data Analysis of Stability in Step III.....	B-9
Statistical Analysis of Stability in Step III.....	B-11
Appendix C	
Total Dissolved Solids Analysis in Main Research Stage.....	C-1
Data Analysis of Total Dissolved Solids in Step I.....	C-1
Statistical Analysis of Total Dissolved Solids in Step I.....	C-3
Data Analysis of Total Dissolved Solids in Step II.....	C-6
Statistical Analysis of Total Dissolved Solids in Step II.....	C-8
Data Analysis of Total Dissolved Solids in Step III.....	C-11
Statistical Analysis of Total Dissolved Solids in Step III.....	C-13
Appendix D	
Radical Scavenging Activity Analysis of Main Research Stage.....	D-1
Calculation of Radical Scavenging Activity Analysis.....	D-1
Data Analysis of Radical Scavenging Activity in Step I.....	D-2
Statistical Analysis of Radical Scavenging Activity in Step I.....	D-6
Data Analysis of Radical Scavenging Activity in Step II.....	D-8
Statistical Analysis of Radical Scavenging Activity in Step II.....	D-10
Data Analysis of Radical Scavenging Activity in Step III.....	D-11
Statistical Analysis of Radical Scavenging Activity in Step III.....	D-13
Appendix E.	
Total Color Differences Analysis of Main Research Stage.....	E-1
Calculation of Total Color Differences Analysis.....	E-1
Data Analysis of Total Color Differences in Step I.....	E-2
Statistical Analysis of Total Color Differences in Step I.....	E-7
Data Analysis of Total Color Differences in Step II.....	E-9

Statistical Analysis of Total Color Differences in Step II.....	E-12
Data Analysis of Total Color Differences in Step III.....	E-13
Statistical Analysis of Total Color Differences in Step III.....	E-17
Appendix F.	
The Making of Optimum Powder using Foam Mat Drying.....	F-1
Appendix G.	
Result of Particle Size	G-1
Appendix H.	
Result of of GC-MS	H-1
Appendix I.	
Result of of HPLC	I-1
Appendix J.	
Total Plate Count.....	J-1
Mold and Yeast	J-1
Identification of Coliform Bacteria	J-2
Identification of <i>Escherichia coli</i> and <i>Salmonella</i>	J-3

