ACKNOWLEDGEMENTS

Thank God for His blessings and guidance to the author during the research and process of writing this thesis report titled “STUDY OF PAPAYA (Carica papaya L.) LEAF UTILIZATION IN THE MAKING OF ANTIDIABETIC FUNCTIONAL DRINK” that is written as partial fulfillment of the academic requirements to obtain the degree of Sarjana Teknologi Pertanian Strata Satu.

This thesis report can not be finished in time without help, guidance, and prayers from other parties. Thus, the author would like to express gratitude to those who had supported the author:

1. Ms. Sisi Patricia L. A. Gultom, M.Eng as thesis supervisor and head laboratory of microbiology lab for the time, help, and guidance given during the research and process of writing this thesis report.

2. Ms. Julia Ratna Wijaya, MAppSc as thesis co-supervisor and Head of Food Technology Department of Universitas Pelita Harapan for the time, help, and guidance given during the research and process of writing this thesis report.

3. Ms. Natania, M.Eng, Mr. Jeremia Manuel, MP, Dr.Ir.Melanie Cornelia, MT, and Ms. Ratna Handayani, MP as head laboratories for the opportunity to conduct research in the laboratories.

4. All laboratory assistants for the time and help during research.

5. All family members for the support during the research and process of writing this thesis report.
6. Adeline Pannadhika, Grace Liesar, and Audrey as companion in laboratories during research.

7. Debby Novianty, Elizabeth Kurniadi, Felicia Audrey, Maya Amelia, and Vanessa Jasmine for the support during research and writing of this thesis report.

8. Adrian Christiady for the support, help, and prayers during research and process of writing this thesis report.

9. All panelists that have participated in sensory evaluations.

10. All members of C class of Food Technology 2011 Universitas Pelita Harapan for the support and information during completion of this thesis report.

11. All friends, lecturers, and relatives that can not be mentioned one by one for the support, information, and prayer for the author during completion of this thesis report.

   Author realizes that this report is not perfect and welcomes critics and suggestions to improve this thesis report. Finally, author also hopes that this thesis report will be useful for the readers.

   Tangerang, June 2015

   Author
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>COVER</td>
<td></td>
</tr>
<tr>
<td>STATEMENT OF THESIS AUTHENTICITY</td>
<td></td>
</tr>
<tr>
<td>APPROVAL BY THESIS SUPERVISOR</td>
<td></td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iv</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>vi</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xi</td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>xii</td>
</tr>
</tbody>
</table>

## CHAPTER I INTRODUCTION

1.1 Background .............................................................................. 1
1.2 Research Problem ..................................................................... 2
1.3 Objectives ................................................................................ 2
1.3.1 General Objective ................................................................. 2
1.3.2 Specific Objectives ................................................................. 2

## CHAPTER II LITERATURE REVIEW

2.1 Papaya (*Carica papaya* L.) ..................................................... 3
   2.1.1 Papaya morphology ............................................................... 3
   2.1.2 Nutrient Content of Papaya Leaf .......................................... 4

2.2 Functional Drink ..................................................................... 6

2.3 Diabetes Mellitus .................................................................... 6

2.4 α-glucosidase Enzyme .............................................................. 7

2.5 Sucralose ................................................................................. 9

## CHAPTER III RESEARCH METHODOLOGY

3.1 Materials and Equipment .......................................................... 10

3.2 Research Procedure .................................................................. 10
3.2.1 Preliminary Research ................................................................. 10
3.2.2 Main Research Stage I .............................................................. 11
3.2.3 Main Research Stage II ............................................................. 12
3.3 Experimental Design ................................................................. 13
3.3.1 Preliminary Research ............................................................... 13
3.3.2 Main Research Stage I .............................................................. 14
3.3.3 Main Research Stage II ............................................................. 15
3.4 Analysis Procedure ................................................................. 16
3.4.1 α-glucosidase Enzyme Inhibition Test (Sugiwati et al., 2009) ........ 16
3.4.2 Toxicity Test using BSLT (Montanher et al., 2002) .................. 17
3.4.3 Total Phenolic Analysis (Haron and Raob, 2014) ..................... 17
3.4.4 Total Flavonoid Analysis (Meda et al., 2005) .......................... 18
3.4.5 Antioxidant Analysis with DPPH method (Dajanta et al., 2013 with modification) .................................................. 18
3.4.6 Color (Sumnu and Sahin, 2008) ............................................... 19
3.4.7 Moisture Content (AOAC, 2005) ............................................. 19
3.4.8 Total Soluble Solid (AOAC, 2005) .......................................... 19
3.4.9 Sensory Evaluation ................................................................. 20
3.4.9.1 Ranking Test (Lawless and Heymann, 2010) .................. 20
3.4.9.2 Scoring and Hedonic Test (Meilgaard et al., 2007) ........ 20
3.4.10 pH (AOAC, 2005) ................................................................. 21

CHAPTER IV RESULTS AND DISCUSSION

4.1 Preliminary Research ................................................................. 22
4.1.1 Total Phenolic ........................................................................ 22
4.1.2 Total Flavonoid .................................................................... 23
4.1.3 Antioxidant Activity ............................................................... 24
4.1.4 Color ...................................................................................... 25
4.1.5 Toxicity .................................................................................. 26
4.1.6 Antidiabetic Activity ............................................................... 27
4.2 Main Research Stage I ................................................................. 28
4.2.1 Ranking Test for Samples Added with Ginger ......................... 29
4.2.2 Ranking Test for Samples Added with Cinnamon ................. 29
4.2.3 Ranking Test for Samples Added with Tamarind ................. 30
4.3 Main Research Stage II ................................................................. 31
  4.3.1 Scoring Test ........................................................................... 31
    4.3.1.1 Color .............................................................................. 32
    4.3.1.2 Aroma ............................................................................ 32
    4.3.1.3 Off Odor ......................................................................... 33
    4.3.1.4 Taste ............................................................................... 34
    4.3.1.5 Aftertaste ....................................................................... 35
  4.3.2 Hedonic Test .......................................................................... 36
    4.3.2.1 Color .............................................................................. 36
    4.3.2.2 Aroma ............................................................................ 36
    4.3.2.3 Off odor ......................................................................... 37
    4.3.2.4 Taste ............................................................................... 38
    4.3.2.5 Aftertaste ....................................................................... 39
    4.3.2.6 Overall ............................................................................ 39
  4.3.3 Physicochemical Characteristics of Most Preferred Functional Drink ................................................................. 40

CHAPTER V CONCLUSIONS AND SUGGESTIONS
  5.1 Conclusions .............................................................................. 43
  5.2 Suggestions .............................................................................. 43

BIBLIOGRAPHY .............................................................................. 43
APPENDICES .................................................................................. 43
LIST OF TABLES

Table 2.1 Nutrient content of papaya leaf ............................................................. 5
Table 3.1 Sample combination of preliminary research ...................................... 13
Table 3.2 Sample combination of main research stage I .................................... 14
Table 3.3 Reaction system for α-glucosidase enzyme inhibition test ............... 17
Table 3.4 Temperature correction factor of hand refractometer ......................... 20
Table 4.1 Color analysis result of papaya leaf extract with different treatments.. 25
Table 4.2 Result of most preferred functional drink analyses ............................ 41
LIST OF FIGURES

Figure 2.1 Young papaya leaf and mature papaya leaf ........................................... 4
Figure 2.2 Chemical structure of α-glucosidase...................................................... 8
Figure 3.1 Flowchart of overall research .............................................................. 12
Figure 4.1 Total phenolic content of papaya leaf extract with different treatments ............................................................... 23
Figure 4.2 Total flavonoid content of papaya leaf extract with different treatments ............................................................... 24
Figure 4.3 Antioxidant activity of papaya leaf extract with different treatments 25
Figure 4.4 Antidiabetic activity of papaya leaf extract with different treatments 27
Figure 4.5 Total score of ranking test of samples added with ginger ................... 29
Figure 4.6 Total score of ranking test of samples added with cinnamon .............. 30
Figure 4.7 Total score of ranking test of samples added with tamarind ............... 31
Figure 4.8 Average score of color of scoring test ................................................. 32
Figure 4.9 Average score of aroma of scoring test ............................................. 33
Figure 4.10 Average score of off odor of scoring test ....................................... 33
Figure 4.11 Average score of taste of scoring test ........................................... 34
Figure 4.12 Average score of aftertaste of scoring test ................................... 35
Figure 4.13 Average score of color of hedonic test ........................................... 36
Figure 4.14 Average score of aroma of hedonic test ....................................... 37
Figure 4.15 Average score of off odor of hedonic test ................................... 38
Figure 4.16 Average score of taste of hedonic test ........................................... 38
Figure 4.17 Average score of aftertaste of hedonic test ................................... 39
Figure 4.18 Average score of overall of hedonic test ...................................... 40
LIST OF APPENDICES

Appendix A. Result of identification test ............................................................ A-1
Appendix B. Result of total phenolic analysis with galic acid standard ............ B-1
Appendix C. Result of total flavonoid analysis with quercetin standard ........ C-1
Appendix D. Result of antioxidant activity analysis with ascorbic acid standard . D-1
Appendix E. Color analysis ................................................................................. E-1
Appendix F. Result of toxicity test ................................................................. F-1
Appendix G. Result of antidiabetic activity assay .............................................. G-1
Appendix H. Questionnaire of ranking test ....................................................... H-1
Appendix I. Data and result of ranking test ...................................................... I-1
Appendix J. Questionnaire of scoring test and hedonic test ............................. J-1
Appendix K. Scoring test data ........................................................................... K-1
Appendix L. Statistical result of scoring test ..................................................... L-1
Appendix M. Hedonic test data ........................................................................ M-1
Appendix N. Statistical result of hedonic test ................................................... N-1
Appendix O. Data and result of final product analyses .................................... O-1
Appendix P. Result of t-test analysis ................................................................. P-1
Appendix Q. Result of final antidiabetic activity ............................................. Q-1