

## ACKNOWLEDGEMENTS

Praise and gratitude to God for His blessings in completing this thesis titled “PHYSICOCHEMICAL CHARACTERISTICS OF OXIDATION METHOD MODIFICATION STARCH OF BOGOR TARO (*Colocasia esculenta* L. SCHOTT)” that was written as partial fulfillment of the academic requirements to obtain *Sarjana Teknologi Pertanian Sastra Satu* Food Technology, Universitas Pelita Harapan.

The author realized without the guidance, help, prayers, and supports from many parties, this thesis will not be completed in its time. Therefore, the author would like to express gratitude and appreciation to those parties, including:

1. Eric Jobiliong, Ph.D., as the Dean of Faculty Science and Technology.
2. Dela Rosa, S.Si, M.M, M.Sc., Apt., as the Vice Dean of Faculty Science and Technology
3. Laurence, M.T., as the Director Administration and Student Affair of Faculty Science and Technology.
4. Ir. W. Donald R. Pokatong, M.Sc., Ph.D., as the Head of Food Technology Study Program UPH, for the support until thesis was completed.
5. Dr.-Ing. Azis Boing Sitanggang S.T.P., M.Sc., as supervisor for the time, guidance, teaching and motivation until this thesis was fully completed.
6. Wenny S.L. Br. Sinaga, M.Si., as Co-Supervisor, and Academic Supervisor for the time, guidance, teaching and motivation during study period until this thesis was fully completed.

7. Dr. Adolf J. N. Parhusip, M.Si., Yuniwaty Halim, M.Sc., Tagor M. Siregar, M.Si., and Natania M.Eng., as the Head of Laboratories, where the author conducted the final project.
8. Adzie, Christoper I. Rimba, STP, Adhi, Darius, and Yosafat Rudju, for helping the author at laboratories.
9. Father (Moh Louis Candra Sutomo), mother (Esther Kurniawati) and brother (Adrian Hartanto Sutomo) as beloved family for the support and prayer.
10. Angeline Vania, Celine Angelia, Yokhebed Fransiska, Margareta Wijaya, Patricia Sani, and Handy Gosun as partner and team under the same supervisor.
11. And all the people than cannot be mentioned one by one.

Author realized that this report still far from perfection and might have some mistakes. Therefore, the author would like to apologize for instance and sincerely accept any suggestions that were given to the author about this report. Author also hopes that this report can be useful for the readers and those who needed. Thank You.

Tangerang, 21<sup>st</sup> February 2019

Grace Josephine Sutomo

## TABLE OF CONTENTS

	Page
COVER PAGE	
STATEMENT OF THESIS AUTHENTICITY	
APPROVAL BY THESIS SUPERVISORS	
APPROVAL BY THESIS EXAMINATION COMMITTEE	
ABSTRACT.....	v
ACKNOWLEDGEMENT.....	vi
TABLE OF CONTENTS.....	viii
LIST OF TABLE.....	xi
LIST OF FIGURE.....	xii
LIST OF APPENDICES.....	xiv
CHAPTER I INTRODUCTION	
1.1 Background.....	1
1.2 Research problem.....	2
1.3 Objective.....	2
1.3.1 General Objective.....	2
1.3.2 Specific Objective.....	2
CHAPTER II LITERATURE REVIEW	
2.1 Taro.....	4
2.2 Starch.....	5
2.3 Resistant Starch.....	7
2.4 Physicochemical properties of resistant starch.....	8
2.5 $\alpha$ -amylase.....	9
2.6 Oxidation method.....	10

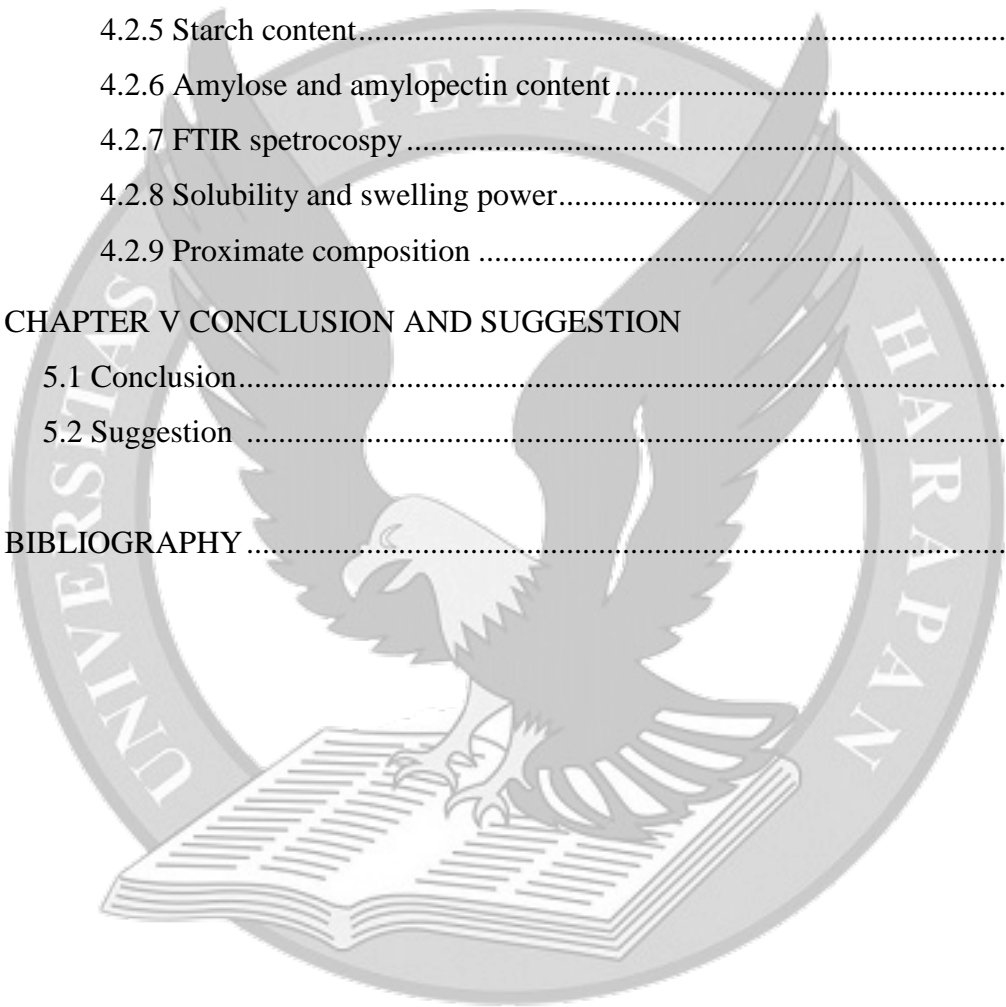
## CHAPTER III METHODOLOGY

3.1 Material and equipment.....	12
3.2 Research Method.....	12
3.2.1 Preliminary Stage.....	13
3.2.1.1 Starch extraction.....	13
3.2.1.2 Oxidation procedure.....	14
3.2.2 Stage I.....	16
3.2.2.1 Procedure.....	16
3.2.2.2 Stage I analysis.....	16
3.2.2.3 Experimental design.....	17
3.2.3 Stage II.....	17
3.2.3.1 Procedure.....	17
3.2.3.2 Stage II analysis.....	18
3.2.3.3 Experimental design.....	18
3.2.4 Analytical procedure.....	20
3.2.4.1 Carboxyl content.....	20
3.2.4.2 Viscosity.....	20
3.2.4.3 Starch color.....	21
3.2.4.4 Amylose and amylopectin content.....	21
3.2.4.5 Solubility and swelling properties.....	21
3.2.4.6 FTIR spectroscopy.....	22
3.2.4.7 Resistant starch content.....	22
3.2.4.8 Starch content.....	23
3.2.4.9 Proximate analysis.....	23
3.2.4.10 Statistical analysis.....	23

## CHAPTER IV RESULT AND DISCUSSION

4.1 Effect of concentration toward starch physicochemical characteristics of modified Bogor taro starch.....	25
4.1.1 Carboxyl content.....	25
4.1.2 Starch color.....	26
4.1.3 Viscosity.....	29

4.2 Effect of concentration, pH, and reaction time toward starch	
physicochemical characteristics of modified Bogor taro starch .....	30
4.2.1 Carboxyl content .....	31
4.2.2 Starch color .....	33
4.2.3 Viscosity.....	35
4.2.4 Resistant starch content.....	38
4.2.5 Starch content.....	39
4.2.6 Amylose and amylopectin content .....	40
4.2.7 FTIR spectroscopy .....	42
4.2.8 Solubility and swelling power.....	42
4.2.9 Proximate composition .....	44
<b>CHAPTER V CONCLUSION AND SUGGESTION</b>	
5.1 Conclusion.....	45
5.2 Suggestion .....	45
<b>BIBLIOGRAPHY .....</b>	<b>46</b>



## LIST OF TABLES

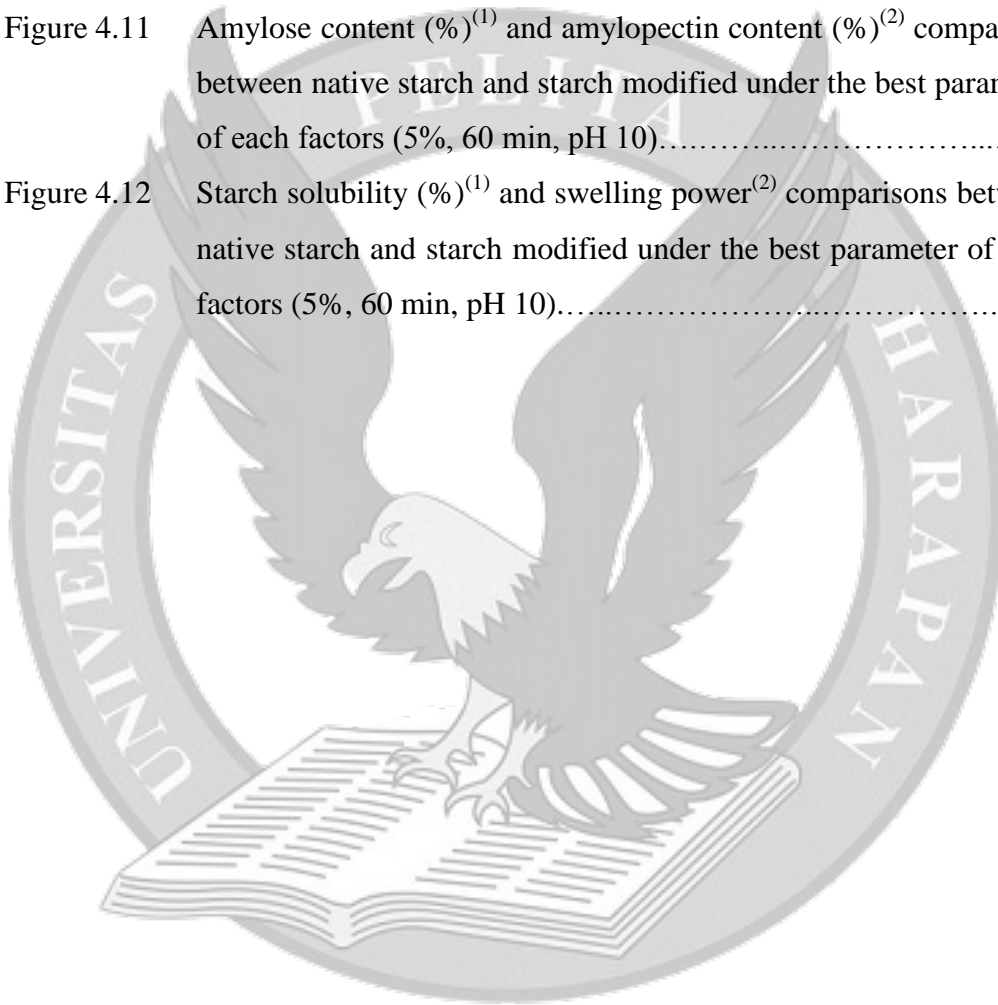
	Page
Table 2.1	Chemical composition of taro on fresh weight basis.....4
Table 3.1	Experimental design stage II.....19
Table 4.1	Proximate composition comparison between native starch and starch modified by oxidation method under the best parameter of each factors (5%, 60 min, pH 10).....44



## LIST OF FIGURES

	Page
Figure 2.1	Amylose and amylopectin structure.....6
Figure 2.2	Chemical reaction of sodium hypochlorite (NaOCl) oxidation of starch.....11
Figure 3.1	Flow chart of Bogor taro starch extraction.....13
Figure 3.2	Flowchart RS modification by oxidation method of taro starch.....14
Figure 4.1	Difference in carboxyl content between control starch and NaOCl oxidized starch at 1%, 3%, and 5% under standard condition.....26
Figure 4.2	Difference in L* value between control starch and NaOCl oxidized starch at 1%, 3%, and 5% under standard condition .....28
Figure 4.3	Difference in C* value between control starch and NaOCl oxidized starch at 1%, 3%, and 5% under standard condition.....28
Figure 4.4	Difference in viscosity between control starch and NaOCl oxidized starch at concentration at 1%, 3%, and 5% under standard condition .....30
Figure 4.5	Effect of reaction time and pH on the amount of carboxyl group formed due to oxidation process.....33
Figure 4.6	Effect of reaction time and pH of modified starch with oxidation method on L*value .....34
Figure 4.7	Effect of reaction time and pH of modified starch with oxidation method on C*value.....35
Figure 4.8	Effect of reaction time and pH of modified starch with oxidation method on starch viscosity (cP).....37

Figure 4.9	Resistant starch content (%) comparisons between native starch and starch modified under the best parameter of each factors (5%, 60 min, pH 10).....	39
Figure 4.10	Starch content (%) comparisons between native starch and starch modified under the best parameter of each factors (5%, 60 min, pH 10).....	40
Figure 4.11	Amylose content (%) <sup>(1)</sup> and amylopectin content (%) <sup>(2)</sup> comparison between native starch and starch modified under the best parameter of each factors (5%, 60 min, pH 10).....	41
Figure 4.12	Starch solubility (%) <sup>(1)</sup> and swelling power <sup>(2)</sup> comparisons between native starch and starch modified under the best parameter of each factors (5%, 60 min, pH 10).....	44





## LIST OF APPENDICES

	Page
Appendix A Bogor taro identification .....	A-1
Appendix B Stage I starch carboxyl content .....	B-1
Appendix C Stage I starch L* value, C*value and hue.....	C-1
Appendix D Stage I starch viscosity .....	D-1
Appendix E Stage II starch carboxyl content .....	E-1
Appendix F Stage II starch L* value, C*value, and hue.....	F-1
Appendix G Stage II starch viscosity.....	G-1
Appendix H Resistant starch content .....	H-1
Appendix I Starch content.....	I-1
Appendix J Amylose content.....	J-1
Appendix K Amylopectin content.....	K-1
Appendix L FTIR spectroscopy.....	L-1
Appendix M Solubility.....	M-1
Appendix N Swelling power.....	N-1
Appendix O Proximate composition.....	O-1