

**EVALUATION OF ANTIOXIDANT, ALPHA-GLUCOSIDASE INHIBITORY
AND ANTIMICROBIAL ACTIVITIES OF EXTRACTS OF PEEL, SEED,
FRUIT FLESH AND ENDOCARP OF *Pometia pinnata***

By

Imelda Adhitama
11505007

BACHELOR'S DEGREE
in

FOOD TECHNOLOGY
FACULTY OF LIFE SCIENCES & TECHNOLOGY



SWISS GERMAN UNIVERSITY
The Prominence Tower
Jalan Jalur Sutera Barat No. 15, Alam Sutera
Tangerang, Banten 15143 - Indonesia

July 2019

Revision after the Thesis Defense on July 16, 2019

STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

Imelda Adhitama

Student

Date

Approved by:

Dr. rer. nat. Filiana Santoso

Thesis Advisor

Date

Febbyandi S. Gz., M. Sc

Thesis Co-Advisor

Date

Dr.-Dipl.-Ing. Samuel P. Kusumocahyo

Dean

Date

Imelda Adhitama

ABSTRACT

EVALUATION OF ANTIOXIDANT, ALPHA-GLUCOSIDASE INHIBITORY
AND ANTIMICROBIAL ACTIVITIES OF EXTRACTS OF PEEL, SEED, FRUIT
FLESH AND ENDOCARP FROM *Pometia pinnata*

By

Imelda Adhitama
Dr. rer. nat. Filiana Santoso, Advisor
Febbyandi S. Gz., M. Sc, Co-Advisor

SWISS GERMAN UNIVERSITY

The research investigated the potential activities of the peel, seed, fruit flesh and endocarp of *Pometia pinnata* as natural sources for antioxidant, alpha-glucosidase inhibitor and antimicrobial agents. The total phenolic and flavonoid contents of the extracts were also determined and correlated to the activities. Three solvents with different polarity (hexane, ethyl acetate and methanol) were applied in the gradient extraction of the fruit.

The endocarp methanolic extract exhibited the strongest antioxidant activity against DPPH radical compounds (IC_{50} 0.27 $\mu\text{g/ml}$), even significantly stronger than commercial antioxidant, L-Ascorbic acid (IC_{50} 8.10 $\mu\text{g/ml}$). The extract was also found to have the highest total phenolic and flavonoid contents. In addition, it revealed the highest alpha-glucosidase inhibitory activity against sucrose and maltose hydrolysis by rat intestinal enzyme, though it was significantly lower than the commercial inhibitor acarbose. Furthermore, the flesh methanolic extract also showed similarly high activity in maltase inhibition. All crude extracts showed bacteriostatic capacity, but the MIC

from broth macrodilution against *Staphylococcus aureus* and *Escherichia coli* were only detected in the endocarp methanolic extract with both MIC 500 µg/ml.

In conclusion, methanol was found to be capable of extracting bioactive compounds contributing as antioxidant, AGI and antimicrobial agents. The endocarp methanolic extracts particularly showed the highest potency in all activities, which was discovered in this study for the first time.

Keywords: Antioxidant, Alpha-Glucosidase Inhibitor, Antimicrobial, Phenolic, Flavonoid





DEDICATION

I dedicate this research for my dear parents, my one and only advisor, and for the
future of medical treatment.



ACKNOWLEDGMENTS

First and foremost, I would like to express my deepest gratitude to God who made this possible. I would not be able to do and endure all of these without His continuous guidance and blessings.

To my precious parents, for their endless love, prayers and supports. No words could describe enough how thankful I am to have you both in my life. To my sisters, who always remind me to rest. Especially to my little big sister, Amanda, for her willingness to help. I love you both no matter what.

To my smart advisor whom I admire and respect, Dr. rer. nat. Filiana Santoso, for your time and guidance within your busy schedules. To my co-advisor, Mr. Febbyandi S. Gz., M. Sc., for your inputs that make me think wider.

To Eric Santosa, who had been such a great listener, my comfort zone. Thank you for always coping up with all the mood-swings and stresses. Your endless motivational support is indeed what I need. May God always guide you in everything you do.

To Devina Rosalia, Stevan Teji, Richard Rhesa, Nicolaus Yansen and Marcel Ario—my forever classmate since junior high school—for your kindness, help, and ridiculous jokes. I would rather call them a family than friends. See you guys on top!

To Ivana Julisantika, my lab-partner, who always made AGI less boring than it is. May your hard-work and eagerness bring you success in the future.

To Ms. Stacia A. Fortunata, Mr. Said Hudryizi, S. Si. and Mr. Rizal Pauzan Ramadhani, S. Si, for their patient and guidance. They are indeed best laboratory assistants.

Lastly, to other lecturers who had been willing to answer my questions. Also to my other classmates whom I cannot mention one by one, thank you for bringing colors to my university life. I wish you all the best.

TABLE OF CONTENTS

	Page
STATEMENT BY THE AUTHOR.....	2
ABSTRACT.....	3
DEDICATION.....	6
ACKNOWLEDGMENTS.....	7
TABLE OF CONTENTS.....	8
LIST OF FIGURES.....	11
LIST OF TABLES.....	13
CHAPTER 1 - INTRODUCTION.....	14
1.1 Background.....	14
1.2 Research Objectives.....	15
1.3 Significance of Study.....	15
1.4 Research Questions.....	16
1.5 Hypothesis.....	16
CHAPTER 2 - LITERATURE REVIEW.....	17
2.1 <i>Pometia pinnata</i> plant.....	17
2.1.1 Fruits of <i>Pometia pinnata</i>	19
2.1.2 Roots of <i>Pometia pinnata</i>	21
2.1.3 Stem of <i>Pometia pinnata</i>	22
2.1.4 Flowers of <i>Pometia pinnata</i>	24
2.1.5 Leaves of <i>Pometia pinnata</i>	24
2.2 Extraction of Medicinal Plant Parts.....	26
2.2.1 Extraction Solvent.....	26

2.2.2	Extraction Method.....	27
2.3	Method of Analysis	28
2.3.1	Antioxidant Activity.....	28
2.3.2	Total Phenolic Content.....	29
2.3.3	Total Flavonoid Content.....	31
2.3.4	α -Glucosidase Inhibitory (AGI) Activity Assay	32
2.3.5	Antimicrobial Testing	33
CHAPTER 3 - RESEARCH METHODS.....		35
3.1	Time and Venue	35
3.2	Material and Equipment	35
3.2.1	Material	35
3.2.2	Equipment	36
3.3	Design of Experiment.....	36
3.4	Experimental Procedures.....	38
3.4.1	<i>Pometia pinnata</i> Peel, Seed, Fruit Flesh and Endocarp Powder.....	38
3.4.2	Extraction Procedure	38
3.5	Analytical Procedures.....	39
3.5.1	DPPH Radical Scavenging Assay	39
3.5.2	Total Phenolic Content.....	40
3.5.3	Total Flavonoid Content.....	41
3.5.4	α -Glucosidase Inhibitory (AGI) Activity Assay	42
3.5.5	Antimicrobial Activity Assay.....	46
3.6	Statistical Analysis	48
3.6.1	Correlation Analysis.....	49
CHAPTER 4 - RESULTS AND DISCUSSIONS.....		50
4.1	Extraction of Peel, Seed, Fruit Flesh and Endocarp of <i>Pometia pinnata</i>	50
4.2	Antioxidant Activity of the Crude Extracts.....	59
4.3	Total Phenolic Content.....	64

4.4	Total Flavonoid Content.....	67
4.5	Correlation of Total Phenolic and Flavonoid Contents with Antioxidant Activity in the Crude Extracts of <i>Pometia pinnata</i>	70
4.6	α -Glucosidase Inhibitor (AGI) Activity of the Crude Extracts	72
4.6.1	Sucrase Inhibition.....	74
4.6.2	Maltase Inhibition	75
4.7	Correlation of Total Phenolic and Flavonoid Contents with α -Glucosidase Inhibitor (AGI) Activity in the Crude Extracts of <i>Pometia pinnata</i>	77
4.8	Antimicrobial Activity of the Crude Extracts	79
4.8.1	Gram Positive Bacteria.....	80
4.8.2	Gram Negative Bacteria	82
4.9	Correlation of Total Phenolic and Flavonoid Content with Antimicrobial Activity in the Crude Extracts of <i>Pometia pinnata</i>	84
	CHAPTER 5 - CONCLUSIONS AND RECOMMENDATIONS.....	87
5.1	Conclusions	87
5.2	Recommendations	89
5.3	Future Commercial Potential.....	89
	GLOSSARY	90
	REFERENCES	91
	APPENDICES	107
	CURRICULUM VITAE.....	180