INFLUENCE OF ACIDIFIED BLANCHING WATER AND PECTINASE ENZYME TREATMENTS ON QUALITY OF *CARICA* PAPAYA JUICE

AINA NADIAH BINTI ZAIDI

UNIVERSITI SAINS MALAYSIA

JULY 2020

PUSAT PENGAJIAN TEKNOLOGI INDUSTRI

UNIVERSITI SAINS MALAYSIA

BORANG PENYERAHAN DISERTASI MUTAKHIR

SATU (1) NASKAH

Nama penyelia: Dr. Maizura Murad

Bahagian: Teknologi Makanan

Saya telah menyemak semua pembetulan/pindaan yang dilaksanakan oleh

~~Encik/Puan~~/Cik Aina Nadiah Binti Zaidi

mengenai disertasinya sebagaimana yang dipersetujui oleh Panel Pemeriksa di Viva Voce-nya.

2. Saya ingin mengesahkan bahawa saya berpuashati dengan pembetulan/pindaan yang dilaksanakan oleh calon.

Sekian, terima kasih.

Maizura Murad, Ph.D
Lecturer
Food Technology Division
School of Industrial Technology
Universiti Sains Malaysia
11800 USM, Penang, Malaysia

(Tandatangan dan cop)

3 August 2020

Tarikh

INFLUENCE OF ACIDIFIED BLANCHING WATER AND PECTINASE ENZYME TREATMENTS ON QUALITY OF *CARICA* PAPAYA JUICE

By

AINA NADIAH BINTI ZAIDI

A dissertation submitted in partial fulfillment of the requirement for the degree of Bachelor of Technology (B.Tech) in the field of Food Technology School of Industrial Technology University Sains Malaysia

July 2020

DECLARATION BY AUTHOR

This dissertation is composed of my original work and contains no material previously published or written by another person except where due reference has been made in the text. The content of my dissertation is the result of work I have carried out since the commencement of my research project and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution.

.....

AINA NADIAH BINTI ZAIDI

JUNE 2020

ACKNOWLEDGEMENT

First and foremost, I would like to thank my supervisor, Dr. Maizura Murad for her guidance in order to complete this project. I would not be able to successfully finish my final year project without her help and support. She was taking care of us and always update our progress.

Secondly, I would like to thank to my parents, En. Zaidi and Pn. Norhayati, and also my family for their support either financially or morally, their prayers and blessing for me to complete this project.

I also thank all those postgraduate students who help me throughout this project. They sincerely answered any queries and helped me through all my confusions regarding the analysis conducted as well as made myself familiar with all the apparatus and chemicals in the laboratory.

Other than that, I wanted to thank all the lecturers and staffs of School of Industrial Technology especially En. Maarof and En. Rahim the lab assistants who always monitored me while I was using any machinery and equipment in laboratory. They ensured me and all the students to use the facilities correctly. Lastly, I was very grateful to have friends who always help and support in order to complete my final year project

AINA NADIAH BINTI ZAIDI

JULY 2020

TABLE OF CONTENTS

DECLARATION BY AUTHOR **ii**

ACKNOWLEDGEMENTS **iii**

TABLE OF CONTENTS **iv**

LIST OF TABLES **vii**

LIST OF FIGURE **viii**

ABSTRAK **ix**

ABSTRACT **x**

CHAPTER 1: INTRODUCTION **1**

1.1 Research Background 1

1.2 Rational of The Study 2

1.3 Research Objective 3

CHAPTER 2 : LITERATURE REVIEW **4**

2.1 Papaya 4

2.1.1 Nutritional Composition 6

2.1.2 Antioxidant Properties of Fruit 7

2.2 Pectin 9

2.3 Fruit Juice 13

2.3.1 Factor Affect The Quality of Fruit Juice 14

2.4 Application of Enzyme in Fruit Juice Processing 16

2.4.1 Pectinase Enzyme 17

2.4.2 Effect of Pectinase Application in Fruit Juice on Antioxidant Properties 19

2.5 Effect of Heat Treatment During Processing on Juice Quality 21

2.5.1 Effect of Blanching on Pectin Degradation 21

2.5.2 Effect of Blanching on the Antioxidant Properties of Juice. 22

CHAPTER 3 : MATERIALS AND METHODS 24

3.1 Materials 24

3.2 Sample Preparation 24

3.3 Acidified Blanching Treatment 24

3.4 Enzymatic Treatment 25

3.5 Physicochemical Properties of Papaya Juice 27

3.5.1 Determination of Percent Yield 27

3.5.2 Determination of Total Soluble Solids (TSS) and pH 27

3.5.3 Determination of Clarity and Viscosity 27

3.5.4 Determination of Colour 27

3.6 Antioxidant Analysis 28

3.6.1 Sample Extraction 28

3.6.2 Total Phenolic Content (TPC) 28

3.6.3 DPPH Assay 29

3.6.4 Determination of Ascorbic Acid 29

3.7 Sensory Analysis 31

3.7.1 Determination of Consumer Acceptability 31

3.7.2 Determination of Food Action Rating Scale (FACT) 31

3.8 Statistical Analyses 32

CHAPTER 4 : RESULTS AND DISCUSSION **33**

4.1Effect of Acidified Blanching Water and Pectinase Enzyme Pre-Treatment on Physicochemical Properties of Papaya Juice. 33

4.2Effect of Acidified Blanching Water and Pectinase Enzyme Pre-Treatment on Colour (L*, a* and b*) of Papaya Juice. 38

4.3Effect of Acidified Blanching Water and Pectinase Enzyme Pre-Treatment on Antioxidant Properties of Papaya Juice. 40

4.4Effect of Acidified Blanching Water and Pectinase Enzyme Pre-Treatment on Consumer Acceptability of Papaya Juice. 43

CHAPTER 5 : CONCLUSION AND RECOMMENDATION **47**

REFERENCES **48**

APPENDICES **56**

LIST OF TABLES

Table Caption	Page
2.1 Papaya production worldwide from 2000 to 2017 (in million metric tons)	5
2.2 Nutritional composition of papaya per 100 g	7
2.3 Antioxidant content of variety fruits	8
2.4 Amount of pectin in various types of fruit.	12
2.5 Pectinase produced by different microorganisms.	18
4.1 Effect of acidified blanching water and enzyme concentration on yield and pH of papaya juice.	34
4.2 Effect of acidified blanching water and enzyme concentration on total soluble solid (TSS), viscosity and clarity of papaya juice	35
4.3 Effect of acidified blanching treatment and enzyme concentration on the colour of papaya juice.	39
4.4 Effect of acidified blanching water and enzyme concentration on total phenolic content (TPC), antioxidant activity and ascorbic acid of papaya juice.	40

LIST OF FIGURE

Table Caption	Page
2.1 Papaya Tree	5
3.1 Flow chart on preparation of papaya juice	26
4.1 Effect of acidified blanching water and combination of acidified blanching water and enzyme treatment on consumer acceptability of papaya juice	41
4.2 Effect of acidified blanching water and combination of acidified blanching water and enzyme treatment on score for food action rating test of papaya juice	43

PENGARUH PENCELURAN AIR BERASID DAN RAWATAN MENGGUNAKAN ENZIM PEKTINASE TERHADAP KUALITI JUS BETIK *CARICA*

ABSTRAK

Buah betik (betik Carica) masak dengan cepat yang mengakibatkan kerugian selepas menuai. Terdapat berbagai produk yang dihasilkan dari betik termasuk jus betik. Namun, pektin yang tinggi, di dalam buah menyebabkan pengekstrakkan jus menjadi susah dan menghasilkan jus yang sangat likat dan pekat. Oleh itu, kajian ini bertujuan untuk mengetahui pengaruh penceluran air berasid dan enzim pektinase terhadap sifat fizikokimia, aktiviti antioksidan dan penerimaan jus betik *Carica*. Betik dirawat menggunakan penceluran air dengan kepekatan asid sitrik (1.5% dan 2.5%) yang berbeza dan kombinasi asid sitrik di dalam penceluran air serta enzim pektinase dengan kepekatan yang berbeza (0.05% dan 0.10%). Penentuan sifat fizikokimia (hasil jus, pH, warna, pepejal larut total (TSS)), antioksidan (jumlah kandungan fenolik (TPC), ujian DPPH dan asid askorbik) dan penerimaan pengguna (ujian hedonik dan ujian skala tindakan makanan (FACTS)) dijalankan. Hasil kajian menunjukkan bahawa penerapan rawatan penceluran air berasid dan rawatan enzim pectinase tidak mempunyai perbedaan kesan yang signifikan ($p > 0,05$) pada peratusan hasil jus betik. Kombinasi penceluran air dengan asid sitrik 1.5% serta rawatan enzim pektinase 0.05% berkesan ($p < 0.05$) untuk merendahkan pektin dan mengurangkan kelikatan dan menghasilkan kejelasan jus betik yang tinggi. Walaupun jumlah TPC dan asid askorbik lebih rendah setelah betik dirawat dengan kombinasi penceluran air dengan asid sitrik 1.5% serta enzim pektinase 0.05% berbanding sampel kawalan dan rawatan penceluran air berasid, tetapi aktiviti pemerangkapan radikal bebas (DPPH) meningkat. Hasil kajian menunjukkan bahawa pengguna menyukai sedikit jus betik yang dirawat dengan penceluran berasid (1.5%) dan enzim pektinase 0.05% yang mempunyai skor penerimaan tertinggi berbanding dengan rawatan lain.

INFLUENCE OF ACIDIFIED BLANCHING WATER AND PECTINASE ENZYME TREATMENTS ON QUALITY OF *CARICA* PAPAYA JUICE

ABSTRACT

Papaya (*Carica* papaya) fruit ripen very fast which resulting post-harvest losses. There are various products made from papaya including papaya juice. However, high pectin content in papaya makes the juice extraction become complicated and produced a very viscous and concentrates papaya juice. Therefore, this study aims to determine the effect of acidified blanching water and pectinase enzyme on physicochemical properties, antioxidant activities and consumer acceptability of *Carica* papaya juice. The papaya was treated with different concentration of citric acid (1.5% and 2.5%) blanching water and combination of citric acid blanching water with different concentration pectinase enzyme (0.05% and 0.10%). Determination of physicochemical properties (yield, pH, colour, total soluble solids (TSS)), antioxidant (total phenolic content (TPC), DPPH assay and ascorbic acid) and consumer acceptability (hedonic test and food action rating scale (FACT) test) were carried out. Result showed that, application of acidified blanching water and pectinase enzyme of treatments, had no significant different ($p>0.05$) effect on the percentage of the papaya juice yield. The combination of 1.5% citric acid blanching water with 0.05% pectinase enzyme treatment was effective ($p<0.05$) to degrade the pectin and reduce the viscosity and produce high clarity of papaya juice. Although the amount of TPC and ascorbic acid were decrease significantly after the papaya was treated with combination of 1.5% citric acid blanching water with 0.05% pectinase enzyme treatment than control and acid blanching treatment, but DPPH scavenging activity was increased ($p<0.05$). Result showed that consumer like slightly the papaya juice treated with acidified blanching water and 0.05% pectinase enzyme which had the highest acceptability score compared to the other treatments