

**PREVENTION ON ENZYMATIC BROWNING OF  
BANANA JUICE BY NATURAL ANTI – BROWNING  
AGENT**

**NUR SYAZWANI BT MOHD NASARODIN**

**Final Year Project Report Submitted in  
Partial Fulfillment of the Requirements for the  
Degree of Bachelor of Science (Hons.) Biology  
In the Faculty of Applied Sciences  
Universiti Teknologi MARA**

**JULY 2017**

This Final Year Project Report entitled “**Prevention on Enzymatic Browning of Banana Juice by Natural Anti – Browning Agent**” was submitted by Nur Syazwani Bt Mohd Nasarodin, in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Biology, in the Faculty of Applied Sciences, and was approved by

---

Amirah Bt Sharif  
Supervisor  
B. Sc. (Hons.) Biology  
Faculty of Applied Sciences  
UiTM Negeri Sembilan  
Kampus Kuala Pilah  
Pekan Parit Tinggi  
72000 Kuala Pilah  
Negeri Sembilan

---

Lili Syahani Rusli  
Project Coordinator  
B. Sc. (Hons.) Biology  
Faculty of Applied Sciences  
UiTM Negeri Sembilan  
Kampus Kuala Pilah  
Pekan Parit Tinggi  
72000 Kuala Pilah  
Negeri Sembilan

---

Dr. Nor'aishah Binti Abu Shah  
Head of Programme  
B. Sc. (Hons.) Biology  
Faculty of Applied Sciences  
UiTM Negeri Sembilan  
Kampus Kuala Pilah  
Pekan Parit Tinggi  
72000 Kuala Pilah  
Negeri Sembilan

Date: \_\_\_\_\_

## TABLE OF CONTENTS

|   | <b>PAGE</b> |
|---|-------------|
| <b>ACKNOWLEDGEMENTS</b>                         | <b>iii</b>  |
| <b>TABLE OF CONTENTS</b>                        | <b>iv</b>   |
| <b>LIST OF TABLES</b>                           | <b>vi</b>   |
| <b>LIST OF FIGURES</b>                          | <b>vii</b>  |
| <b>LIST OF ABBREVIATIONS</b>                    | <b>viii</b> |
| <b>ABSTRACT</b>                                 | <b>ix</b>   |
| <b>ABSTRAK</b>                                  | <b>x</b>    |
| <br>  |             |
| <b>CHAPTER 1: INTRODUCTION</b>                  |             |
| 1.1 Background Study                            | 1           |
| 1.2 Problem Statement                           | 3           |
| 1.3 Significance of the Study                   | 3           |
| 1.4 Objectives of the study                     | 4           |
| <br>  |             |
| <b>CHAPTER 2: LITERATURE REVIEW</b>             |             |
| 2.1 Enzymatic Browning                          | 5           |
| 2.1.1 Polyphenol oxidase (PPO)                  | 6           |
| 2.1.2 Peroxidase (POD)                          | 7           |
| 2.2 Polyphenol                                  | 7           |
| 2.3 Anti – Browning Agent                       | 9           |
| 2.4 Natural Anti – Browning Agent               | 10          |
| <br>  |             |
| <b>CHAPTER 3: METHODOLOGY</b>                   |             |
| 3.1 Materials                                   | 13          |
| 3.1.1 Raw materials                             | 13          |
| 3.1.2 Chemicals                                 | 13          |
| 3.1.3 Apparatus                                 | 13          |
| 3.2 Methods                                     | 14          |
| 3.2.1 Onion extract preparation                 | 14          |
| 3.2.2 Banana juice preparation                  | 14          |
| 3.2.3 Enzyme polyphenol oxidase (PPO) assay     | 15          |
| 3.2.4 Preparation of Gallic acid standard curve | 15          |
| 3.2.5 Determination of total phenolic content   | 16          |
| 3.3 Data Analysis                               | 17          |

|   |           |
|---|-----------|
| <b>CHAPTER 4: RESULTS AND DISCUSSION</b>                            |           |
| 4.1 Effect of Onion on Polyphenol Oxidase Activity of Banana Juices | 18        |
| 4.2 Determination of total phenol content in banana juices          | 21        |
| <b>CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS</b>                   | <b>25</b> |
| <b>CITED REFERENCES</b>   | <b>26</b> |
| <b>APPENDICES</b>   | <b>31</b> |
| <b>CURRICULUM VITAE</b>   | <b>39</b> |

## ABSTRACT

### PREVENTION ON ENZYMATIC BROWNING OF BANANA JUICE BY NATURAL ANTI – BROWNING AGENT

Browning that occurs in fruits causes the nutritional value and product quality of fruit juices declines due to oxidation of polyphenol compounds that triggers the generation of brown, red or black pigments. The development of natural anti – browning agent has increased due to growing number of consumers that interest in fresh, natural and organic products. Onion has been reported to be a potent natural anti – browning agent. The effects of the onion extract on polyphenol oxidase enzyme in banana juice were investigated. PPO assay was determined by treated the banana juice with heated onion extract at concentration of 1.0, 2.5, 3.5 and 5.0  $\mu\text{g/ml}$ . Addition of 5  $\mu\text{g/ml}$  onion extract, gave the greatest inhibitory effect,  $65.276 \pm 0.620$  % on banana polyphenol oxidase activity. The total phenolic content (TPC) was measured by Folin Ciocalteu reagent method and Gallic acid used as standard. TPC varied from  $5.265 \pm 0.009$  mg GAE / 100 ml for treatment with highest heated onion extract to  $5.613 \pm 0.001$  mg GAE / 100 ml for treatment with lowest heated onion extract. The inhibitory effect of polyphenol oxidase enzyme of banana juice by onion extract was increased with the increasing of concentration and time. Banana juices that treated with heated onion extract showed reduce browning as well as increased total phenolic concentration. Thus, it can be conclude that addition of onion extract may greatly inhibit browning and improve quality of banana juice.