



## TABLE OF CONTENTS

|   |             |
|---|-------------|
| <b>THESIS .....</b>   | <b>ii</b>   |
| <b>ENDORSEMENT PAGE .....</b>   | <b>iii</b>  |
| <b>DECLARATION .....</b>  | <b>iv</b>   |
| <b>MOTTO AND DEDICATION .....</b>                                       | <b>v</b>    |
| <b>ACKNOWLEDGMENT.....</b>  | <b>vi</b>   |
| <b>TABLE OF CONTENTS.....</b>   | <b>viii</b> |
| <b>LIST OF TABLE .....</b>  | <b>x</b>    |
| <b>LIST OF FIGURE .....</b>   | <b>xi</b>   |
| <b>APPENDICES.....</b>  | <b>xiii</b> |
| <b>ABSTRACT .....</b>   | <b>xiv</b>  |
| <b>INTISARI.....</b>  | <b>xv</b>   |
| <b>CHAPTER I INTRODUCTION .....</b>                                     | <b>1</b>    |
| 1.1 Background of Study .....   | 1           |
| 1.2 Problem Statement .....   | 5           |
| 1.3 Objectives .....  | 6           |
| 1.4 Benefits of Study.....  | 6           |
| <b>CHAPTER II LITERATURE REVIEW.....</b>                                | <b>8</b>    |
| 2.1 Red Fruit ( <i>Pandanus conoideus</i> ).....                        | 8           |
| 2.2 Extraction of Red Fruit Oil .....                                   | 11          |
| 2.2.1 Sample-to-solvent ratio .....                                     | 12          |
| 2.2.2 Temperature of Extraction.....                                    | 12          |
| 2.2.3 Extraction Time .....   | 13          |
| 2.2.4 Oil Extraction from Red Fruit.....                                | 13          |
| 2.3 Bioactive Compounds and Antioxidant Activity of Red Fruit Oil ..... | 15          |
| 2.3.1. Phenolic Compounds .....   | 16          |
| 2.3.2. Antioxidant Activity.....  | 16          |
| 2.3.3. FTIR .....   | 17          |
| 2.4 Ultrasound-assisted Extraction.....                                 | 18          |
| 2.5 Box-Behnken Design with RSM (Response Surface Methodology) .....    | 21          |
| 2.6 Hypothesis.....   | 22          |
| <b>CHAPTER III RESEARCH METHODS.....</b>                                | <b>24</b>   |
| 3.1 Chemical, Reagent, and Instrument.....                              | 24          |
| 3.1.1 Chemical and Reagents .....                                       | 24          |
| 3.1.2 Instruments .....   | 24          |
| 3.2 Sample .....  | 25          |
| 3.2.1 Sample Preparation .....  | 26          |
| 3.2.2 Red Fruit Oil Extraction Method using UAE .....                   | 27          |
| 3.2.3 Optimal Extraction Time RFO using UAE .....                       | 28          |
| 3.2.4 Wet Rendering Method .....  | 28          |
| 3.2.5 Application UAE for RFO Production of Six Red Fruit Clones .....  | 29          |
| 3.2.6 Chemical Analysis of Red Fruit Oil.....                           | 29          |
| 3.3 Experimental Design and Statistical Analysis .....                  | 35          |
| <b>CHAPTER IV RESULT AND DISCUSSION .....</b>                           | <b>37</b>   |
| 4.1 Effect of Independent Variables.....                                | 37          |



|  |           |
|--|-----------|
| 4.2 Prediction Capability of Regression Model.....               | 41        |
| 4.3 Optimization of The UAE Method.....                          | 43        |
| 4.4 Optimal Extraction Time .....                                | 47        |
| 4.5 Confirmation Model of The Prediction Optimum Conditions..... | 48        |
| 4.6 UAE Application for Red Fruit Oil Extraction .....           | 49        |
| 4.6.1 Yield of Oil.....  | 49        |
| 4.6.2 Total Phenolic Compounds .....                             | 52        |
| 4.6.3 Scavenging Activity on DPPH Radical.....                   | 54        |
| 4.6.4 Metal Ion-Chelating .....                                  | 57        |
| 4.6.5 Reducing Power.....  | 59        |
| 4.6.6 Scavenging Activity on ABTS Radical.....                   | 61        |
| 4.6.7 FTIR spectral analysis.....                                | 64        |
| <b>CHAPTER IV CONCLUSION AND RECOMMENDATION.....</b>             | <b>70</b> |
| 5.1 Conclusion .....   | 70        |
| 5.2 Recommendation.....  | 71        |
| <b>REFERENCES .....</b>  | <b>72</b> |
| <b>APPENDICES.....</b>   | <b>80</b> |