DETERMINATION OF ANTIOXIDANT ACTIVITY AND BETALAIN PIGMENT OF FREEZE DRIED RED BEET (*BETA VULGARIS* L.) EXTRACT WITH MALTODEXTRIN ADDITION AND pH VARIATION

PENENTUAN AKTIVITAS ANTIOKSIDAN DAN PIGMEN BETALAIN PADA *FREEZE DRIED* EKSTRAK BIT MERAH (*BETA VULGARIS* L.) DENGAN PENAMBAHAN MALTODEKSTRIN DAN VARIASI pH

THESIS

Submitted to The Faculty of Agricultural Technology in partial fulfillment of the requirements for obtaining the Bachelor Degree

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THE AUTHENTICITY OF A THESIS STATEMENT

I hereby declare that the thesis entitled "**DETERMINATION OF ANTIOXIDANT ACTIVITY AND BETALAIN PIGMENT OF FREEZE DRIED RED BEET (*BETA VULGARIS* L.) EXTRACT WITH MALTODEXTRIN ADDITION AND pH VARIATION"** contains no work that ever proposed to acquire a bachelorship title in a University, and along to my knowledge, there is no work ever written or published by others, except the ones used as references in this thesis and mentioned in the list of references.

If it is proven in the future that partially or whole thesis is the result of plagiarism, therefore I will be willing to be revoked with all the consequences in accordance with the law and regulations applied at Seogijapranata Catholic University and/or valid law and regulations.

Semarang, 28th October 2015

Stella Giovani Gondomartono

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SUMMARY

Color is one of the most important indicators that will determine consumer acceptance of foods. Unfortunately, the availability of natural food colorant in Indonesia is very limited. One of natural red dye material is red beet (*Beta vulgaris* L.) since it contains high concentration of betalain pigment. Betalain pigment is one of pigments that contained in red beet which give contributions in high antioxidant activity. Betalain is a pigment consists of betaxanthin pigment (yellow-orange pigments) and betacyanin pigment group (red-violet pigments). However, the heating process wiould make the betalain pigment in red beets (*Beta vulgaris* L.) become unstable and has a short shelf life. Thus, the drying method using freeze dryer is required to produce a natural red dye of red beet powder. Drying method by using freeze dryer aims to extend the shelf life of red beet powder. In this research, the additions of maltodextrin and acidity arrangement were also conducted. The addition of maltodextrin used as a microencapsulation agents to maintain the nutritional content of red beet. While, the acidity arrangement applied to adjust the acidity of the red beet. This research was conducted with the addition of five different kinds of maltodextrin concentrations (0%, 20%, 30%, 40% and 60%) and three pH variations (4, 5, and 6). The red beets were dried using freeze dryer for 48 hours. The samples were analyzed using High Performance Liquid Chromatography (HPLC), spectrophotometric method, and antioxidant activity using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method. Red beet powder made with 20% maltodextrin as microencapsulating agent and pH 4, gives the highest yield in antioxidant activity (% inhibition) (86.40 ± 4.73%) and betanin content (16243.04 ± 737,802). While 20% maltodextrin addition as microencapsulating agent with pH 5, gives the highest yield in betaxanthin content (2068.63 ± 346.51) and betacyanin content (2886.98 ± 274.04) are similar with fresh red beets.

RINGKASAN

Warna merupakan salah satu indikator yang paling penting dalam menentukan penerimaan konsumen terhadap makanan. Namun, ketersediaan pewarna makanan alami di Indonesia masih sangat terbatas. Salah satu pewarna merah alami adalah bit merah (*Beta vulgaris* L.) yang mengandung pigmen betalain dalam konsentrasi tinggi. Pigmen betalain adalah salah satu pigmen yang terkandung di bit merah dan juga memberikan kontribusi aktivitas antioksidan yang tinggi. Betalain merupakan pigmen yang terdiri dari pigmen betaxantin (warna kuning-oranye) dan pigmen betasianin (warna merah-violet). Akan tetapi, selama pengolahan terutama jika menggunakan proses pemanasan akan membuat pigmen betalain di bit merah (*Beta vulgaris* L.) menjadi tidak stabil dan memiliki umur simpan pendek. Dengan demikian, metode pengeringan menggunakan *freeze dryer* diperlukan untuk menghasilkan bubuk pewarna merah alami dari bit merah. Pengeringan dengan menggunakan *freeze dryer* bertujuan untuk memperpanjang umur simpan. Dalam penelitian ini, penambahan maltodekstrin dan pengaturan keasaman juga turut dilakukan. Penambahan maltodekstrin digunakan sebagai agen mikroenkapsulasi untuk mempertahankan kandungan gizi bit merah. Sedangkan pengaturan keasaman dilakukan menggunakan asam askorbat untuk mengatur keasaman dari bit merah. Penelitian ini dilakukan dengan penambahan lima jenis yang berbeda dari konsentrasi maltodekstrin (0%, 20%, 30%, 40% dan 60%) dan tiga variasi pH (pH 4, 5, dan 6). Selanjutnya, bit merah dikeringkan menggunakan *freeze dryer* selama 48 jam. Setelah itu, sampel dianalisis menggunakan *High Performance Liquid Chromatography* (HPLC), metode spektrofotometri, dan aktivitas antioksidan menggunakan metode DPPH. Bubuk bit merah yang dibuat dengan menggunakan 20% maltodekstrin sebagai agen mikroenkapsulasi dan pH 4, memberikan hasil tertinggi dalam aktivitas antioksidan (% inhibisi) (86,40 ± 4,73%) dan kandungan betanin (16243,04 ± 737,802). Sementara 20% maltodekstrin dengan menggunakan pH 5, memberikan hasil tertinggi dalam kandungan betaxantin (2068,63 ± 346,51) dan kandungan betasianin (2886,98 ± 274,04) yang hampir sama dengan bit merah segar.

PREFACE

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The author realized that this report is still far from perfect and there are still many shortcomings due to the limitation of the author. However, the author hope that this report can still be an inspiration and provide useful information for all the reader.

Semarang, 28th October 2015

Stella Giovani

Author

LIST OF CONTENT

Page

SUMMARY ..... **i**
RINGKASAN ..... **ii**
PREFACE ..... **iii**
LIST OF CONTENT ..... **v**
LIST OF TABLES ..... **vi**
LIST OF FIGURES ..... **vii**
LIST OF APPENDIX ..... **viii**
1. INTRODUCTION **1**
1.1. Background 1
1.2. Literature Review 2
1.2.1. Betalain Pigment in Red beet (*Beta vulgaris* L.) 2
1.2.2. Antioxidant Activity in Red Beet (*Beta vulgaris* L.) 5
1.2.3. Maltodextrin as a Microencapsulation Agent 5
1.2.4. Ascorbic Acid to Conditioning the pH 6
1.2.5. Freeze Drying as a Drying Method 6
1.2.6. HPLC to Identity Betanin Compounds 7
1.3. Purpose of Research 8
2. MATERIAL AND METHODS **9**
2.1. Place Time 9
2.2. Research Materials 9
2.3. Research Methods 9
2.4. Research Design 10
2.5. Product Analysis 11
3. RESULTS OF RESEARCH **13**
3.1. Betanin Determination using HPLC Analysis 13
3.2. Betaxanthins and Betacyanins Determination using Different Maltodextrin Addition 20
3.3. Betaxanthins and Betacyanins Determination using pH Variation 24
3.4. Antioxidant Activity (% Inhibition) in Red Beet Powder 22
3.5. Correlation Between Antioxidan Activity with Betalain Content 26
4. DISCUSSION **27**
4.1. The Red Beet Powder Production using Freeze Drying Method 27
4.2. Betanin Determination using HPLC Analysis in Red Beet Powder 28
in Red Beet Powder 30
4.4. Antioxidant Activity (% inhibition) in Red Beet Powder 31
5. CONCLUSIONS AND RECOMMENDATIONS **34**
5.1. Conclusions 34
5.2. Recommendations 34
6. REFERENCES **35**
7. APPENDIX **39**

LIST OF TABLES

Page

Table 1.The yield of Red Beet Powders using Different Maltodextrin Addition 19
Table 2. The Betalain Content of Red Beet Powder using Different Maltodextrin Addition 20
Table 3. The Antioxidant Activity of Red Beet Powder using Different Maltodextrin Addition 22
Table 4. The yield of Red Beet Powders using Different pH Conditions 23
Table 5. The Betalain Content of Red Beet Powder using Different pH Conditions..... 24
Table 6. The Antioxidant Activity of Red Beet Powder using Different pH Conditions 25
Table 7. Correlation Between Antioxidan Activity with Betalain Content..... 26

LIST OF FIGURES

Page

Figure 1. Red Beet (*Beta vulgaris L.*)..... 3
Figure 2. Betaxanthin's chemical structure in Red Beet (Vargas *et al.*, 2000) 4
Figure 3. Betacyanin's chemical structure in Red Beet (Vargas *et al.*, 2000)..... 4
Figure 4. Betanin's chemical structure in Red Beet(Vargas *et al.*, 2000)..... 4
Figure 5. Red beet powder after freeze drying process 9
Figure 6. High Performance Liquid Chromatography Shimadzu LC-10AT VP..... 11
Figure 7. Sample after added with 3.9 ml of DPPH solution 12
Figure 8. Chromatograms of betanin standard 13
Figure 9. Chromatograms of betanin using 0% maltodextrin concentration..... 14
Figure 10. Chromatograms of betanin using 20% maltodextrin concentration..... 15
Figure 11. Chromatograms of betanin using 30% maltodextrin concentration..... 16
Figure 12.Chromatograms of betanin using 40% maltodextrin concentration..... 17
Figure 13. Chromatograms of betanin using 60% maltodextrin concentration..... 18
Figure 14. Betanin Content of Red Beet Powder with Different Maltodextrin..... 20
Figure 15. Betalain Content with Different Maltodextrin Concentration 21
Figure 16.Betanin Content using Maltodextrin 20% with Different pH Conditions 23
Figure 17. Red beet powder using 20% Maltodextrin Concentration 24
Figure 18. Betalain Content using Maltodextrin 20% with Different pH Conditions.... 25
Figure 19. Percentage Inhibition of Red Beet Powder using 20% Maltodextrin Concentration..... 26

\

LIST OF APPENDIX

Page

Appendix 1. Chromatograms of betanin standard 39
Appendix 2. Chromatograms of betanin using 0% maltodextrin concentration 39
Appendix 3. Chromatograms of betanin using 20% maltodextrin concentration 40
Appendix 4. Chromatograms of betanin using 30% maltodextrin concentration 41
Appendix 5. Chromatograms of betanin using 40% maltodextrin concentration 42
Appendix 6. Chromatograms of betanin using 60% maltodextrin concentration 43
Appendix 7. Output of Test of Normality on Betanin with Maltodextrin Treatments ... 44
Appendix 8. Output of Post Hoc One Way Anova on Betanin with Maltodextrin Treatments 45
Appendix 9. Output of Test of Normality on Betanin with pH Variation 45
Appendix 10.Output of Post Hoc One Way Anova on Betanin with pH Variation 45
Appendix 11.Output of Test of Normality on Betaxanthin with Maltodextrin Treatments 46
Appendix 12.Output of Post Hoc One Way Anova on Betaxanthin with Maltodextrin Treatments 46
Appendix 13. Output of Test of Normality on Betaxanthin with pH Variation 46
Appendix 14.Output of Post Hoc One Way Anova on Betaxanthin with pH Variation 47
Appendix 15.Output of Test of Normality on Betacyanin with Maltodextrin Treatment 47
Appendix 16.Output of Post Hoc One Way Anova on Betacyanin with Maltodextrin Treatments 48
Appendix 17. Output of Test of Normality on on Betacyanin Analysis with pH Variation 48
Appendix 18.Output of Post Hoc One Way Anova on Betacyanin with pH Variation 48
Appendix 19.Output of Test of Normality on Antioxidant Activity with Maltodextrin Treatments 49
Appendix 20. Output of Post Hoc One Way Anova on Antioxidant Activity with Maltodextrin Treatments 49
Appendix 21. Output of Test of Normality on Antioxidant Activity Analysis with pH Variation 50
Appendix 22. Output of Post Hoc One Way Anova on Antioxidant Activity s with pH Variation 50
Appendix 23. Output of Pearson Correlation between Antioxidan Activity with Betalain Content in Red Beet Powder 51