

BAB V

KESIMPULAN DAN SARAN

V.1. Kesimpulan

1. Ekstraksi antosianin dari buah naga menghasilkan *Total Anthocyanin Content* (TAC) tertinggi dengan konsentrasi 76 ppm.
2. Suhu ekstraksi yang menghasilkan *Total Anthocyanin Content* (TAC) tertinggi adalah 50°C.
3. Waktu ekstraksi yang menghasilkan *Total Anthocyanin Content* (TAC) tertinggi adalah 10 menit.
4. pH larutan yang menghasilkan *Total Anthocyanin Content* (TAC) tertinggi adalah pH 5.

V.2. Saran

Perlu dilakukan penelitian lebih lanjut mengenai efek penambahan antosianin alami ke dalam minyak goreng, yaitu untuk mempelajari pengaruh rasio minyak dengan antosianin (v/m) dan waktu penyimpanan terhadap persen penurunan bilangan peroksida dan bilangan anisidin minyak.

DAFTAR PUSTAKA

1. Putri, N.K.M., I.W.G. Gunawan, and I.W. Suarsa, *Aktivitas Antioksidan Antosianin dalam Ekstrak Etanol Kulit Buah Naga Super Merah (*Hylocereus costaricensis*) dan Analisis Kadar Totalnya*. Jurnal Kimia (Journal of Chemistry), 2015.
2. Nursaerah, R., *Mempelajari Ekstraksi Antosianin dari Kulit Buah Manggis (*Garcinia mangostana L.*) Dengan Berbagai Jenis Pelarut*. 2010.
3. Wang, H., G. Cao, and R.L. Prior, *Oxygen radical absorbing capacity of anthocyanins*. Journal of agricultural and Food Chemistry, 1997. **45**(2): p. 304-309.
4. De Man, J.M., *Kimia makanan*. Penerbit ITB. Bandung, 1997.
5. Giusti, M.M. and R.E. Wrolstad, *Acylated anthocyanins from edible sources and their applications in food systems*. Biochemical engineering journal, 2003. **14**(3): p. 217-225.
6. Lou, X., H.-G. Janssen, and C.A. Cramers, *Parameters affecting the accelerated solvent extraction of polymeric samples*. Analytical Chemistry, 1997. **69**(8): p. 1598-1603.
7. Markaris, P., G.E. Livingston, and C.R. Fellers, *Quantitative aspects of strawberry pigment degradation a, b*. Journal of Food Science, 1957. **22**(2): p. 117-130.
8. Moulana, R., et al., *Efektivitas Penggunaan Jenis Pelarut dan Asam dalam Proses Ekstraksi Pigmen Antosianin Kelopak Bunga Rosella (*Hibiscus sabdariffa L.*)*. Jurnal Teknologi dan Industri Pertanian Indonesia, 2012. **4**(3).
9. Rodriguez-Saona, L.E. and R.E. Wrolstad, *Extraction, isolation, and purification of anthocyanins*. Current protocols in food analytical chemistry, 2001(1): p. F1. 1.1-F1. 1.11.
10. Bakker, J. and C.F. Timberlake, *The distribution of anthocyanins in grape skin extracts of port wine cultivars as determined by high performance liquid chromatography*. Journal of the Science of Food and Agriculture, 1985. **36**(12): p. 1315-1324.
11. Kapasakalidis, P.G., R.A. Rastall, and M.H. Gordon, *Extraction of polyphenols from processed black currant (*Ribes nigrum L.*) residues*. Journal of agricultural and food chemistry, 2006. **54**(11): p. 4016-4021.
12. Cooper-Driver, G.A., *Contributions of Jeffrey Harborne and co-workers to the study of anthocyanins*. Phytochemistry, 2001. **56**(3): p. 229-236.

13. da Costa, C.T., D. Horton, and S.A. Margolis, *Analysis of anthocyanins in foods by liquid chromatography, liquid chromatography–mass spectrometry and capillary electrophoresis*. Journal of Chromatography A, 2000. **881**(1-2): p. 403-410.
14. Périno-Issartier, S., M. Abert-Vian, and F. Chemat, *Solvent free microwave-assisted extraction of antioxidants from sea buckthorn (*Hippophae rhamnoides*) food by-products*. Food and Bioprocess Technology, 2011. **4**(6): p. 1020-1028.
15. Vinatoru, M., T. Mason, and I. Calinescu, *Ultrasonically assisted extraction (UAE) and microwave assisted extraction (MAE) of functional compounds from plant materials*. TrAC Trends in Analytical Chemistry, 2017. **97**: p. 159-178.
16. Eskilsson, C.S. and E. Björklund, *Analytical-scale microwave-assisted extraction*. Journal of chromatography A, 2000. **902**(1): p. 227-250.
17. Talebi, M., et al., *Optimization of the extraction of paclitaxel from *Taxus baccata* L. by the use of microwave energy*. Journal of separation science, 2004. **27**(13): p. 1130-1136.
18. Pan, X., G. Niu, and H. Liu, *Microwave-assisted extraction of tea polyphenols and tea caffeine from green tea leaves*. Chemical Engineering and Processing: Process Intensification, 2003. **42**(2): p. 129-133.
19. Chemat, F. and G. Cravotto, *Microwave-assisted extraction for bioactive compounds: theory and practice*. Vol. 4. 2012: Springer Science & Business Media.
20. Anton, M. and G. Gandemer, *Composition, solubility and emulsifying properties of granules and plasma of egg yolk*. Journal of Food Science, 1997. **62**(3): p. 484-487.
21. Lam, R.S. and M.T. Nickerson, *Food proteins: a review on their emulsifying properties using a structure–function approach*. Food chemistry, 2013. **141**(2): p. 975-984.
22. Yujie, C. and L. Shuying, *Research advance in the extraction and application of egg yolk lecithin*. Food and Fermentation Industries, 2002. **28**(5; ISSU 173): p. 50-53.
23. Setiawan, b., *MEMPELAJARI PEMBUATAN BUMBU KEMIRI (*Aleurites Moluccana*) DALAM BENTUK BUBUK Studing of Making Candlenut Seasoning In Powder Form*.
24. Fox, N. and G. Stachowiak, *Vegetable oil-based lubricants—a review of oxidation*. Tribology international, 2007. **40**(7): p. 1035-1046.

25. Ayucitra, A., et al., *Potensi senyawa fenolik bahan alam sebagai antioksidan alami minyak goreng nabati*. Widya Teknik, 2013. **10**(1): p. 1-10.
26. Ketaren, S., *Pengantar Teknologi Minyak dan Lemak Pangan*. UI Press. Jakarta, 1986.
27. Allen, J.C. and R.J. Hamilton, *Rancidity in foods.. ed. 3*. 1994: Chapman and Hall Ltd.
28. Sherwin, E., *Antioxidants for vegetable oils*. Journal of the American Oil Chemists' Society, 1976. **53**(6Part2): p. 430-436.
29. Ingrath, W., *Ekstraksi Pigmen Antosianin Dari Kulit Buah Naga Merah (*Hylocereus Costaricensis*) Sebagai Pewarna Alami Makanan Dengan Menggunakan Microwave (Kajian Waktu Pemanasan dengan Microwave dan Penambahan Rasio Pelarut Aquades dan Asam Sitrat)*. Jurnal Bioproses Komoditas Tropis, 2015. **3**(3): p. 1-8.
30. Kurniasari, O.A., *Ekstraksi Pigmen Kulit Buah Naga Merah (*Hylocereus polyrhizus*) dengan Metode Microwave-Assisted Extraction (MAE)*. 2016, Universitas Gadjah Mada.
31. Farida, R. and F.C. Nisa, *EKSTRAKSI ANTOSIANIN LIMBAH KULIT MANGGIS METODE MICROWAVE ASSISTED EXTRACTION (LAMA EKSTRAKSI DAN RASIO BAHAN: PELARUT)[IN PRESS APRIL 2015]*. Jurnal Pangan dan Agroindustri, 2014. **3**(2): p. 362-373.
32. Yang, Z. and W. Zhai, *Optimization of microwave-assisted extraction of anthocyanins from purple corn (*Zea mays L.*) cob and identification with HPLC-MS*. Innovative food science & emerging technologies, 2010. **11**(3): p. 470-476.
33. Ulya, D., N. El Husna, and M. Novita, *Ekstraksi Antosianin Limbah Terung Belanda (*Solanum betaceum Cav.*) Menggunakan Metode Microwave Assisted Extraction*. Jurnal Ilmiah Mahasiswa Pertanian, 2018. **3**(1): p. 409-414.
34. Zaidel, D.N.A., et al., *Encapsulation of anthocyanin from roselle and red cabbage for stabilization of water-in-oil emulsion*. Agriculture and Agricultural Science Procedia, 2014. **2**: p. 82-89.
35. Azeez, O.T., et al., *Effects of antioxidants on the oxidative stability of vegetable oil at elevated temperature*. International Journal of Applied Science and Technology, 2013. **3**(5).
36. Simanjuntak, L., C. Sinaga, and Fatimah, *Ekstraksi Pigmen Antosianin dari Kulit Buah Naga Merah (*Hylocereus polyrhizus*)*.

37. Bridgers, E.N., M.S. Chinn, and V.-D. Truong, *Extraction of anthocyanins from industrial purple-fleshed sweetpotatoes and enzymatic hydrolysis of residues for fermentable sugars*. Industrial Crops and Products, 2010. **32**(3): p. 613-620.
38. Ju, Z.Y. and L.R. Howard, *Effects of solvent and temperature on pressurized liquid extraction of anthocyanins and total phenolics from dried red grape skin*. Journal of Agricultural and food Chemistry, 2003. **51**(18): p. 5207-5213.
39. Rejeki, D.P., *Ekstrak Daun Ubi Jalar Ungu sebagai Antioksidan untuk Memperlambat Ketengikan (Ranciditas) pada Minyak Kelapa*. Lantanida Journal, 2019. **6**(2): p. 114-125.
40. Jackman, R. and J. Smith, *Anthocyanins and betalains*, in *Natural food colorants*. 1996, Springer. p. 244-309.
41. Harborne, J.B., *Metode Fitokimia Penuntun Cara Modern Menganalisa Tumbuhan, Diterjemahkan oleh Keokasih Padmawinata*. 1987.
42. Marszałek, K., et al., *The effect of high pressure techniques on the stability of anthocyanins in fruit and vegetables*. International journal of molecular sciences, 2017. **18**(2): p. 277.
43. Ali, F., F. Ferawati, and R. Arqomah, *Ekstraksi zat warna dari kelopak bunga rosella (study pengaruh konsentrasi asam asetat dan asam sitrat)*. Jurnal Teknik Kimia, 2013. **19**(1).
44. Fathinatullabibah, F., L.U. Khasanah, and K. Kawiji, *Stabilitas antosianin ekstrak daun jati (*Tectona grandis*) terhadap perlakuan pH dan suhu*. Jurnal Aplikasi Teknologi Pangan, 2014. **3**(2).
45. Khajeh, M., A.R.A. Moghaddam, and E. Sanchooli, *Application of Doehlert design in the optimization of microwave-assisted extraction for determination of zinc and copper in cereal samples using FAAS*. Food analytical methods, 2010. **3**(3): p. 133-137.
46. Patras, A., et al., *Effect of thermal processing on anthocyanin stability in foods; mechanisms and kinetics of degradation*. Trends in Food Science & Technology, 2010. **21**(1): p. 3-11.
47. Santos-Buelga, C. and G. Williamson, *Methods in polyphenol analysis*. 2003: Royal Society of chemistry.
48. Lucchesi, M.E., et al., *Solvent free microwave extraction of *Ellettaria cardamomum* L.: A multivariate study of a new technique for the extraction of essential oil*. Journal of Food Engineering, 2007. **79**(3): p. 1079-1086.

49. Saptaaji, R. *Studi Pendahuluan Mengenai Degradasi Zat Warna Azo (Metil Orange) Dalam Pelarut Air Menggunakan Mesin Berkas Elektron 350 keV/10 mA.* in *Jurnal Forum Nuklir.* 2007.
50. Salisbury, F. and C. Ross, *Fisiologi Tumbuhan I. Sel: air, larutan dan permukaan.* Edisi Keempat. 1995, Terjemahan.
51. Corrlett, D. and M. Brown, *pH and Acidity dalam Microbial Biology of Food. Volume I.* 1980, Academic Press. New York.
52. Wulaningrum, R.A., W. Sunarto, and M. Alauhdin, *Pengaruh Asam Organik dalam Ekstraksi Zat Warna Kulit Buah Manggis (Garcinia mangostana).* Indonesian Journal of Chemical Science, 2013. **2**(2).
53. Kirca, A., M. Özkan, and B. Cemeroğlu, *Effects of temperature, solid content and pH on the stability of black carrot anthocyanins.* Food chemistry, 2007. **101**(1): p. 212-218.
54. Vargas, M.d.L.V., et al., *Extraction and stability of anthocyanins present in the skin of the dragon fruit (Hylocereus undatus).* Food and Nutrition Sciences, 2013. **4**(12): p. 1221.
55. Eganathan, P. and A. Parida, *Micropropagation of Sauvignon androgynus (L.) Merr.—An important green leafy vegetable.* 2012.
56. Roliadi, H., R. Sudradjat, and A. Anggraini, *Kemungkinan Penggunaan Antioksidan Guna Mempertinggi Ketahanan Oksidasi Biodiesel dari Minyak Biji Tanaman Jarak Pagar (Jatropha curcas L.).* Jurnal Penelitian Hasil Hutan, 2012. **30**(1): p. 69-86.
57. Siswati, N.D. and J. SU, *Pemanfaatan Antioksidan Alami Flavonol Untuk Mencegah Proses Ketengikan Minyak Kelapa.* Jurnal Teknologi Pangan, 2013. **4**(1).
58. ANSHORI, H., *Penurunan Kadar Bilangan Peroksida Pada Minyak Jelantah Menggunakan Serbuk Brokoli 10% b/v (Brassica Oleracea L. Var Italica) Berdasarkan Variasi Lama Waktu Perendaman.* 2017, Universitas Muhammadiyah Semarang.
59. Prabowo, A., S.A. Budhiyanti, and A. Husni, *Ekstrak Sargassum sp. sebagai antioksidan dalam sistem emulsi minyak ikan selama penyimpanan pada suhu kamar.* Jurnal Pascapanen dan Bioteknologi Kelautan dan Perikanan, 2013. **8**(2): p. 143-150.
60. Cikita, I., I.H. Hasibuan, and R. Hasibuan, *PEMANFAATAN FLAVONOID EKSTRAK DAUN KATUK (Sauvignon androgynus (L) Merr) SEBAGAI ANTIOKSIDAN PADA MINYAK KELAPA.* Jurnal Teknik Kimia USU, 2016. **5**(1): p. 45-51.
61. Kinanti, W., *PENURUNAN BILANGAN PEROKSIDA PADA MINYAK JELANTAH MENGGUNAKAN SERBUK DAUN SALAM*

- (*Syzygium polyanthum*) DENGAN VARIASI KONSENTRASI. 2017, Universitas Muhammadiyah Semarang.
- 62. Sulistiowati, R. and S. Al Aajilaini, *Pengaruh Penambahan Bawang Merah (*Allium ascalonicum*) Terhadap Penurunan Bilangan Peroksida dalam Minyak Jelantah*. Pena Medika Jurnal Kesehatan, 2017. 7(2).
 - 63. Gordon, M., *The mechanism of antioxidant action in vitro*, in *Food antioxidants*. 1990, Springer. p. 1-18.
 - 64. Ribéreau-Gayon, P., et al., *Handbook of Enology, Volume 2: The Chemistry of Wine-Stabilization and Treatments*. Vol. 2. 2006: John Wiley & Sons.
 - 65. Hosu, A., V.-M. Cristea, and C. Cimpoiu, *Analysis of total phenolic, flavonoids, anthocyanins and tannins content in Romanian red wines: Prediction of antioxidant activities and classification of wines using artificial neural networks*. Food chemistry, 2014. **150**: p. 113-118.
 - 66. Brühl, L., *Official Methods and Recommended Practices of the American Oil Chemist's Society, Physical and Chemical Characteristics of Oils, Fats and Waxes, Section I. Ed. The AOCS Methods Editor and the AOCS Technical Department*. 54 pages. AOCS Press, Champaign, 1996. Lipid/Fett, 1997. **99**(5): p. 197-197.
 - 67. Frankel, E.N., *Lipid oxidation*. 2014: Elsevier.
 - 68. Shahidi, F., *Bailey's industrial oil & fats products*. 2004: John Wiley & Sons Hoboken, NJ.