

BAB V

KESIMPULAN DAN SARAN

V.1. Kesimpulan

Kesimpulan yang dapat diperoleh dari penelitian ini adalah polaritas pelarut menentukan distribusi senyawa antioksidan yang berpengaruh terhadap aktivitas antioksidan dan antidiabetesnya, dimana:

1. Pelarut terbaik untuk memperoleh TPC tertinggi adalah pelarut yang mempunyai polaritas sedang (semi polar), dalam hal ini etil asetat.
2. Pelarut terbaik untuk memperoleh aktivitas penetralan radikal bebas DPPH tertinggi adalah pelarut yang mempunyai polaritas sedang (semi polar) yaitu n-butanol.
3. Pelarut terbaik untuk untuk memperoleh aktivitas antidiabetes tertinggi adalah pelarut yang mempunyai polaritas rendah (non-polar) yaitu n-heksana.

V.2. Saran

Dari hasil penelitian ini, beberapa saran yang diberikan antara lain:

1. Pentingnya studi lebih lanjut terkait dengan senyawa-senyawa antioksidan yang terkandung dalam kulit jeruk purut dalam penentuan kondisi fraksinasi ekstrak kulit jeruk purut.
2. Pentingnya pemilihan pelarut yang digunakan untuk melakukan pemisahan senyawa-senyawa antioksidan yang terkandung dalam *crude extract* melalui proses fraksinasi sehingga perolehan-perolehan senyawa-senyawa tertentu yang menjadi fokus ekstraksi (terkait dengan aplikasinya) dapat dimaksimalkan.

DAFTAR PUSTAKA

1. Mahan, L.K., S. Escott-Stump, and J.L. Raymond, *Medical Nutrition Therapy*. 13 ed. 2012, United States of America: Elsevier Saunders.
2. Organization, W.H., *Definition and Diagnosis of Diabetes Mellitus and Intermediate Hyperglycemia*. 2006, WHO Press: Geneva, Switzerland. p. 1-41.
3. Muhtadi, A.L. Hidayati, A. Suhendi, T.A. Sudjono, and Haryoto, *Pengujian Daya Antioksidan dari Beberapa Ekstrak Kulit Buah Asli Indonesia dengan Metode FTC*. 2014, Universitas Muhammadiyah Surakarta: Simposium Nasional RAPI XIII. p. K50-K58.
4. Ampasavate, C., S. Okonogi, and S. Anuchapreeda, *Cytotoxicity of Extracts from Fruit Plants Against Leukemic Cell Lines*. African Journal of Pharmacy and Pharmacology, 2010. **4**(1): p. 13-21.
5. Putri, H., S. Nagadi, Y.A. Larasati, N. Wulandari, and A. Hermawan, *Cardioprotective and hepatoprotective effects of Citrus hystrix peels extract on rats model*. Asian Pacific Journal of Tropical Biomedicine, 2013. **3**(5): p. 371-375.
6. Choi, S.-Y., H.-C. Ko, S.-Y. Ko, J.-H. Hwang, J.-G. Park, S.-H. Kang, S.-H. Han, S.-H. Yun, and S.-J. Kim, *Correlation between Flavonoid Content and the NO Production Inhibitory Activity of Peel Extracts from Various Citrus Fruits*. Biol. Pharm. Bull, 2007. **30**(4): p. 772-778.
7. Setyabudi, C., S. Tanda, W.I. Santosa, and F.E. Soetaredjo, *Studi In Vitro Ekstrak Kulit Jeruk Purut untuk Aplikasi Terapi Diabetes Melitus*. Jurnal Ilmiah Widya Teknik, 2015. **14**(1): p. 15-19.
8. Nathanael, J., *Uji Aktivitas Sitotoksik Ekstrak Kulit Jeruk Purut (Citrus hystrix) pada Sel HeLa Cervical Cancer Cell Line*, in Universitas Atma Jaya Yogyakarta. 2015, Universitas Atma Jaya Yogyakarta: Universitas Atma Jaya Yogyakarta. p. 1-57.
9. Parashar, S., H. Sharma, and M. Garg, *Antimicrobial and Antioxidant Activities of Fruits and Vegetable Peels: A Review*. Journal of Pharmacognosy and Phytochemistry, 2014. **3**(1): p. 160-164.
10. Ghafar, M.F.A., K.N. Prasad, K.K. Weng, and A. Ismail, *Flavonoid, hesperidine, total phenolic contents and antioxidant activities from Citrus species*. African Journal of Biotechnology, 2009. **9**(3): p. 326-330.

11. Abirami, A., G. Nagarani, and P. Siddhuraju, *In vitro Antioxidant, Anti-Diabetic, Cholinesterase and Tyrosinase Inhibitory Potential of Fresh Juice from Citrus hystrix and C. maxima fruits*. Food Science and Human Wellness, 2014. **3**: p. 16-25.
12. Dhianawaty, D. and Ruslin, *Kandungan Total Polifenol dan Aktivitas Antioksidan dari Ekstrak Metanol Akar Imperata cylindrica (L) Beauv. (Alang-alang)*. MKB, 2015. **47**(1): p. 60-64.
13. Redha, A., *Flavonoid: Struktur, Sifat Antioksidatif dan Peranannya dalam Sistem Biologis*. Jurnal Belian, 2010. **9**(2): p. 196-202.
14. Amaro, M.I., J. Rocha, H. Vila-Real, M. Eduardo-Figueira, H. Mota-Filipe, B. Sepedes, and M.H. Ribeiro, *Anti-Inflammatory Activity of Naringin and The Biosynthesised Naringenin by Naringinase Immobilized in Microstructured Materials in a Model of DSS-Induced Colitis in Mice*. Food Research International, 2009. **42**(8): p. 1010-1017.
15. Bakheet, S.A. and S.M. Attia, *Evaluation of Chromosomal Instability in Diabetic Rats Treated with Naringin*. Hindawi Publishing Corporation Oxidative Medicine and Cellular Longevity, 2011: p. 1-9.
16. Ahmed, O.M., A.M. Mahmoud, A. Abdel-Moneim, and M.B. Ashour, *Antidiabetic Effects of Hesperidin and Naringin in Type 2 Diabetic Rats*. Diabetologia Croatica, 2012. **41**(2): p. 53-67.
17. Pari, L. and S. Suman, *Antihyperglycemic and Antilipidperoxidative Effects of Flavanoid Naringin in Streptozotocin-Nicotinamide Induced Diabetic Rats*. Int J Biol Med Res. , 2010. **1**(4): p. 206-210.
18. Handayani, S., *Kromatografi Lapis Tipis untuk Penentuan Kadar Hesperidin dalam Kulit Buah Jeruk*. Jurnal Saintek dan Humaniora LPM, 2005. **10**(1): p. 53-68.
19. Toumi, M.L., S. Merzoug, A. Boutefnouchet, A. Tahraoui1, K. Ouali, and M.A. Guellati, *Hesperidin, A Natural Citrus Flavanone, Alleviates Hyperglycaemic State and Attenuates Embryopathies in Pregnant Diabetic Mice*. Journal of Medicinal Plants Research, 2009. **3**(11): p. 862-869.
20. Firdausi, I., R. Retnowati, and Sutrisno, *Fraksinasi Ekstrak Metanol Daun Mangga Kasturi (Mangifera Casturi Kosterm) dengan Pelarut n-Butanol*. Kimia Student Journal, 2015. **1**(1): p. 785-790.
21. Patel, D.K., R. Kumar, D. Laloo, and S. Hemalatha, *Evaluation of phytochemical and antioxidant activities of the different fractions*

- of *Hybanthus enneaspermus* (Linn.) F. Muell. (Violaceae). Asian Pacific Journal of Tropical Medicine, 2011. **4**(5): p. 391-396.
22. Zhu, K.-X., C.-X. Lian, X.-N. Guo, W. Peng, and H.-M. Zhou, *Antioxidant activities and total phenolic contents of various extracts from defatted wheat germ*. Food Chemistry, 2011. **126**: p. 1122-1126.
23. Giada, M.d.L.R., *Food Phenolic Compounds: Main Classes, Sources and Their Antioxidant Power*, in *Oxidative Stress and Chronic Degerative DIseases - A Role for Antioxidants* 2013, Intech.
24. Manach, C., A. Scalbert, C. Morand, C. Remesy, and L. Jimenez, *Polyphenols: food sources and bioavailability*. J Clin Nutr, 2004. **79**(5): p. 727-747.
25. Xiao, J., G. Kai, K. Yamamoto, and X. Chen, *Advance in dietary polyphenols as α -glucosidases inhibitors: a review on structure-activity relationship aspect*. Crit Rev Food Sci Nutr, 2013. **53**(8): p. 818-836.
26. Jung, U.J., M.K. Lee, K.S. Jeong, and M.S. Choi, *The Hypoglycemic Effects of Hesperidin and Naringin are Partly Mediated by Hepatic Glucose-Regulating Enzymes in C57BL/KsJ-db/db mice*. J Nutr., 2004. **134**(10): p. 2499-2503.
27. Ortiz-Andrade, R.R., J.C. Sánchez-Salgado, G. Navarrete-Vázquez, S.P. Webster, M. Binnie, S. García-Jiménez, I. León-Rivera, P. Cigarroa-Vázquez, R. Villalobos-Molina, and S. Estrada-Soto, *Antidiabetic and Toxicological Evaluations of Naringenin in Normoglycaemic and Niddm Rat Models and Its Implications on Extra-Pancreatic Glucose Regulation*. Diabetes Obes Metab., 2008. **10**(11): p. 1097-1104.
28. Prakash, A., F. Rigelhof, and E. Miller, *Antioxidant Activity*. Medallion Laboratories: p. 1-4.
29. Patel, S.S. and R.K. Goyal, *Cardioprotective effects of gallic acid in diabetes-induced myocardial dysfunction in rats*. Pharmacognosy Res, 2011. **3**(4): p. 239-45.
30. Nair, S.S., V. Kavrekar, and A. Mishra, *In Vitro Studies on Alpha Amylase and Alpha Glucosidase Inhibitory Activities of Selected Plant Extracts*. Euro. J. Exp. Bio., 2013. **3**(1): p. 128-132.
31. Sultana, B., F. Anwar, and M. Ashraf, *Effect of Extraction Solvent/Technique on the Antioxidant Activity of Selected Medicinal Plant Extracts*. Molecules, 2009. **14**: p. 2167-2180.
32. Ibrahim, M.A., N.A. Koordanally, and M.S. Islam, *Butanol fraction of Ziziphus mucronata (Willd) root ethanolic extract*

- contains anti-oxidative agents and potent inhibitors α -glucosidase and α -amylase* Indian Journal of Experimental Biology, 2013.
33. Irawaty, W., F.E. Soetaredjo, A. Ayucitra, M.E. Sianto, K. Jonathan, C. D., C. Setyabudi, and S. Tanda, *Antioxidant and Antidiabetic Activities of Ethanolic Citrus Hystrix Peel Extract: Optimization of Extraction Conditions*. Australian Journal of Basic and Applied Sciences, 2014. **8**(14): p. 85-89.
34. Zhao, B. and C.A.H. III, *Composition and antioxidant activity of raisin extracts obtained from various solvents*. Food Chemistry, 2008. **108**: p. 511-518.
35. Barchan, A., M. Bakkali, A. Arakrak, R. Pagán, and A. Laglaoui, *The effects of solvents polarity on the phenolic contents and antioxidant activity of three Mentha species extracts*. International Journal of Current Microbiology and Applied Sciences, 2014. **3**(11): p. 399-412.
36. Abdullah, N., K.S. Zulkifli, A. Abdullah, N. Aziman, and W.S.S.W. Kamrudin, *Assessment on the Antioxidant and Antibacterial Activities of Selected Fruit Peels*. International Journal of ChemTech Research, 2012. **4**(4): p. 1534-1542.
37. Castellano, G., J. Tena, and F. Torrens, *Classification of Phenolic Compounds by Chemical Structural Indicators and Its Relation to Antioxidant Properties of Posidonia Oceanica (L.) Delile*. MATCH Communications in Mathematical and in Computer Chemistry, 2012. **67**: p. 231-250.
38. Ayuningtyas, I.N., *Glikosida*. 2015, Jakarta: Universitas Indonesia.
39. Chaudhary, S.K., P.K. Mukherjee, N. Maiti, A.K. De, S. Bhadra, and B.P. Saha, *Evaluation of Angiotensin converting enzyme inhibition and anti-oxidant activity of Piper longum L*. Indian Journal of Traditional Knowledge, 2013. **12**(3): p. 478-482.
40. Faloon, W., *Metformin Makes Headline News*. 2012: Life Extension.
41. Hossain, S., M. El-Sayed, and H. Aoshima, *Antioxidative and anti- α -amylase activities of four wild plants consumed by pastoral nomads in Egypt*. Oriental Pharmacy and Experimental Medicine, 2009. **9**(3): p. 217-224.
42. Harjadi, W., *Ilmu Kimia Analitik Dasar*. 1993, Jakarta: PT. Gramedia Pustaka Utama.