

BAB 5

KESIMPULAN DAN SARAN

5.1 Kesimpulan

Berdasarkan hasil penelitian yang berjudul “Pengaruh Jenis Pelarut terhadap Kadar Flavonoid Dalam Ekstraksi Daun Binahong (*Anredera cordifolia*) sebagai Antioksidan dengan Metode Perkolasi”, dapat disimpulkan bahwa:

1. Perbedaan jenis pelarut memberikan pengaruh terhadap kadar flavonoid daun Binahong yang diekstraksi, di mana pelarut etanol 70% (5,0508 mgQE/g) menghasilkan kadar tertinggi, diikuti oleh etil asetat (2,5828 mgQE/g), dan air (1,4126 mgQE/g).
2. Perbedaan jenis pelarut juga memberikan pengaruh terhadap aktivitas antioksidan daun Binahong, di mana ekstrak etanol 70% menunjukkan aktivitas antioksidan paling kuat (IC_{50} : 250,2723 ppm, dibandingkan dengan ekstrak etil asetat (IC_{50} : 512,0250 ppm) dan ekstrak air (IC_{50} : 666,1883 ppm).

5.2 Saran

Berdasarkan hasil penelitian dan kendala teknis yang ditemukan selama proses penelitian, maka saran yang dapat diberikan yaitu dilakukan modifikasi metode ekstraksi apabila menggunakan pelarut air pada daun Binahong, karena kandungan lendir (*mucilago*) yang tinggi dapat menghambat laju alir pada perkulator. Oleh karena itu, disarankan penggunaan teknik dekantasi dan penyaringan vakum untuk mengatasi kendala tersebut. Serta, perlu dilakukan penelitian lebih lanjut terkait variasi jenis pelarut dan metode ekstraksi yang optimal untuk memperoleh kadar flavonoid dan aktivitas antioksidan tertinggi dari daun Binahong.

DAFTAR PUSTAKA

- Abo El-Fadl, S.R., Osman, A., Al-Zohairy, A.M., Dahab, A.A. and Abo El Kheir, Z.A. 2020, Assessment of total phenolic, flavonoid content, antioxidant potential and HPLC profile of three *Moringa* species leaf extracts, *Scientific Journal of Flowers and Ornamental Plants*, **7(1)**: 53-70.
- Alba, T.M., de Pelegrin, C.M.G. and Sobottka, A.M. 2020, Ethnobotany, ecology, pharmacology, and chemistry of *Anredera cordifolia* (Basellaceae): a review, *Rodriguesia*, **71**: 1-11.
- Al Faysal, A., Kaya, B.S., Elmacioglu, H. and Gölcü, A. 2025, A comprehensive evaluation of contemporary techniques employed to measure the antioxidant activity of plant extracts from Turkey, both *in vitro* and *in vivo*, *Journal of Pharmaceutical and Biomedical Analysis Open*, **6**: 100091.
- Anati, N., Mohamad, Z. and Roslan, N.R. 2025, Optimizing solvent selection for phytochemical extraction from *Senna alata* (L.) Roxb. leaves in Terengganu, Malaysia, *Journal of Experimental Biology and Agricultural Sciences*, **13**: 716-725.
- Andrade, C. 2021, A student's guide to the classification and operationalization of variables in the conceptualization and design of a clinical study: Part 1, *Indian Journal of Psychological Medicine*, **43(2)**: 177-179.
- Arifin, B. dan Ibrahim, S. 2018, Struktur, bioaktivitas dan antioksidan flavonoid, *Jurnal Zarah*, **6(1)**: 21-29.
- Azwanida, N. 2015, A review on the extraction methods used in medicinal plants: principle, strength and limitation, *Medicinal and Aromatic Plants*, **4(3)**: 3-8.
- Bhadange, Y.A., Carpenter, J. and Saharan, V.K. 2024, A comprehensive review on advanced extraction techniques for retrieving bioactive components from natural sources, *ACS Omega*, **9(29)**: 31274-31297.
- BPOM. 2016, Serial The Power of Obat Asli Indonesia: Binahong *Anredera cordifolia* (Ten.) Steenis, *BPOM*.
- De Carvalho Rodrigues, V., Da Silva, M.V., Dos Santos, A.R., Zielinski, A.A.F. and Haminiuk, C.W.I. 2015, Evaluation of hot and cold

extraction of bioactive compounds in teas, *International Journal of Food Science and Technology*, **50(9)**: 2038-2045.

Departemen Kesehatan Republik Indonesia. 2000, *Parameter Standar Umum Ekstrak Tumbuhan Obat*, Jakarta: Departemen Kesehatan Republik Indonesia.

Dewi, K. A., Kusumaningrum, S., Prasetya, N. B. A., Kusumastuti, S. A., Rismana, E., Ngatinem, N., Nuralih, N. and Wulansari, M. T. 2025, Potential of Binahong (*Anredera cordifolia* (Ten.) Steenis) leaf extract as a wound healing agent that inhibits matrix metalloproteinases (MMPs) using in silico and stimulates NIH-3T3 cell proliferation by in vitro assay, *Pharmacia*, **72**: 1-15.

Do, Q.D., Angkawijaya, A.E., Tran-Nguyen, P.L., Huynh, L.H., Soetaredjo, F.E., Ismadji, S. and Ju, Y.H. 2014, Effect of extraction solvent on total phenol content, total flavonoid content, and antioxidant activity of *Limnophila aromatica*, *Journal of Food and Drug Analysis*, **22(3)**: 296-302.

Erwin, E., Kuncoro, H., Noviyanti, E., Rijai, L. and Suharto, S. 2019, Profiling and DPPH radical scavenging activity of the bark of Tampoi (*Baccaurea macrocarpa*), *F1000Research*, **8**: 1-19.

Forman, H.J. and Zhang, H. 2021, Targeting oxidative stress in disease: promise and limitations of antioxidant therapy, *Nature Reviews Drug Discovery*, **20(9)**: 689-709.

Gulcin, I. and Alwasel, S. H. 2023, Antiradical and antioxidant activities of ethanolic extract of *Thymus nummularis* and its inhibitory effect on xanthine oxidase, *Frontiers in Chemistry*, **11(1)**: 1-13.

Hasanah, A. dan Mawarni, N. 2020, Penentuan kadar fenolik total dan flavonoid total ekstrak metanol rimpang kencur (*Kaempferia galanga* L.) dengan variasi pH. *Jurnal Farmasi Lampung*, **9(2)**: 91-99.

Hassanpour and Doroudi, H. 2023, Synergistic effects of ascorbic acid and silver nanoparticles on the growth of *Solanum lycopersicum* under cadmium stress, *BMC Plant Biology*, **23(1)**: 1-13.

Helmidanora, Sukawaty, Y. dan Warnida, H. 2020, Penetapan kadar flavonoid total ekstrak etanol daun Binahong (*Anredera cordifolia* (Ten.) Steenis) menggunakan metode Spektrofotometri UV-Vis. *Jurnal Farmasi Dan Ilmu Kefarmasian Indonesia*, **7(2)**: 203-208.

- KEMENKES. 2016, *Formularium Obat Herbal Asli Indonesia*, Kementerian Kesehatan Republik Indonesia.
- Kementerian Kesehatan Republik Indonesia. 2022, *Farmakope Herbal Indonesia, Edisi II*, Jakarta: Kementerian Kesehatan Republik Indonesia.
- Knez, E., Kadac-Czapska, K. and Grembecka, M. 2025, Evaluation of Spectrophotometric Methods for Assessing Antioxidant Potential in Plant Food Samples-A Critical Approach, *Applied Sciences*, **15(11)**: 5925
- Kotha, R. R., Tareq, F. S., Yildiz, E. and Luthria, D. L. 2022, Oxidative Stress and Antioxidants-A Critical Review on *In Vitro* Antioxidant Assays, *Antioxidants*, **11(12)**: 2388.
- Kurutas, E. B. 2016, The importance of antioxidants which play the role in cellular response against oxidative/nitrosative stress: current state. *Nutrition Journal*, **15(71)**: 1-22.
- Kusumaningrum, M., Fardhyanti, D.S., Jai, J., Yulianto, D.N., Suminar, I.S. and Nurjaya (2023). Effect of Solvent Type and Extraction Time on Binahong Leaf Extraction Process, *IOP Conference Series: Earth and Environmental Science*, **1203**: 1-11.
- Liguori, I., Russo, G., Curcio, F., Bulli, G., Aran, L., Della-Morte, D., Gargiulo, G., Testa, G., Cacciatore, F., Bonaduce, D. and Abete, P. 2018, Oxidative stress, aging, and diseases, *Clinical Interventions in Aging*, **13**: 757-772.
- Maheshwaran, L., Nadarajah, L., Senadeera, S. P. N. N., Ranaweera, C. B., Wijerathna, T. W. M. M. W. T. B. and Dassanayake, D. P. M. L. L. 2024, Phytochemical Testing Methodologies and Principles for Preliminary Screening/ Qualitative Testing, *Asian Plant Research Journal*, **12(5)**: 11-38.
- Martemucci, G., Costagliola, C., Mariano, M., D'andrea, L., Napolitano, P. and D'Alessandro, A. G. 2022, Free Radical Properties, Source and Targets, Antioxidant Consumption and Health, *Oxygen*, **2(2)**: 48-78.
- Mehmood, A., Javid, S., Khan, M. F., Ahmad, K. S., and Mustafa, A. 2022, *In vitro* total phenolics, total flavonoids, antioxidant and antibacterial activities of selected medicinal plants using different solvent systems, *BMC Chemistry*, **16**: 64.

- Molyneux, P. 2004, The use of the stable free radical diphenylpicrylhydrazyl (DPPH) for estimating antioxidant activity. *Songklanakarin Journal of Science and Technology*, **26(2)**: 211-219
- Munteanu, I. G. and Apetrei, C. 2021, Analytical Methods Used in Determining Antioxidant Activity: A Review, *International Journal of Molecular Sciences*, **22(7)**: 3380.
- Munthe, S. W. N., Riskianto, R., Juvi, D. and Novia, J. 2023, Antioxidant, Total Phenolic, and Total Flavonoid of 70% Ethanol Extract of Avocado Seeds (*Persea americana* Mill.), *Pharmacognosy Journal*, **15(4)**: 599-605.
- Nielsen, B. B. and Raswant, A. 2018, The selection, use, and reporting of control variables in international business research: A review and recommendations, *Journal of World Business*, **53(6)**: 958–968.
- Nur Athiqah, M. Y., Azhari, A. N., Mohamad Zamri, N. A. Z. and Roslan, N. R. (2025), Optimizing Solvent Selection for Phytochemical Extraction from *Senna alata* (L.) Roxb. Leaves in Terengganu, Malaysia, *Journal of Experimental Biology and Agricultural Sciences*, **13(5)**, 716-725.
- Nurani, L.H., Edityaningrum, C.A., Guntarti, A. dan Zainab. 2024, Teknik Ekstraksi dan Analisis Kimia Tumbuhan Obat, Yogyakarta: UAD Press.
- Oktavia, F.D. and Sutoyo, S. 2021, Skrining fitokimia, kandungan flavonoid total, dan aktivitas antioksidan ekstrak etanol tumbuhan *Selaginella doederleinii*, *Jurnal Kimia Riset*, **6(2)**: 141-153.
- Panche, A. N., Diwan, A. D. and Chandra, S. R. 2016, Flavonoids: an overview. *Journal of Nutritional Science*, **5**: 47.
- Perkasa, A. Y. 2023. An introduction to the plant Binahong (*Anredera cordifolia* (Ten.) Steenis) as a source of antioxidant compounds. *Erciyes Tarım ve Hayvan Bilimleri Dergisi*, **6(2)**: 16-20.
- Pizzino, G., Irrera, N., Cucinotta, R., Pallio, G., Mannino, F., Arcoraci, V., Squadrito, F., Altavilla, D. and Bitto, A. 2017, Oxidative stress: harms and benefits for human health, *Oxidative Medicine and Cellular Longevity*, **2017**: 1-13
- Prantika, S.A., Susanti, D. dan Nofita, N. 2024, Uji aktivitas antibakteri ekstrak etanol daun Binahong (*Anredera cordifolia* (Ten.) Steenis) terhadap *Staphylococcus epidermidis* dan *Propionibacterium acnes*,

- Pratiwi, D. dan Wardaniati, I. 2019, Pengaruh variasi perlakuan (segar dan simplisia), *Jurnal Farmasi Higea*, **11(2)**: 159-165.
- Pujiastuti, A., Erwiyani, A.R. dan Sunnah, I. 2022, Perbandingan kadar flavonoid total dan aktivitas antioksidan ekstrak labu kuning dengan variasi pelarut, *Jurnal Farmasi*, **4(2)**.
- Purwaningsih, H., Nababan, R.C. dan Firmansyah, Y.W. 2025, Eksplorasi Binahong (*Anredera cordifolia* (Ten.) Steenis) batang hijau dan merah: studi organoleptik, mikroskopis dan skrining fitokimia, *Jurnal Farmasi*, **9(2)**: 13139-13148.
- Rahardhian, M.R.R. dan Utami, D. 2016, Uji sitotoksik dan antiproliferasi ekstrak eter daun Binahong (*Anredera cordifolia* (Ten.) Steenis) terhadap sel HeLa, *Media Farmasi Indonesia*, **13(1)**: 1284-1292.
- Ramos, R. T. M., Bezerra, I. C. F., Ferreira, M. R. A. and Soares, L. A. L. 2020, Liquid chromatography high-resolution mass spectrometry analysis, phytochemical and biological study of two Aizoaceae plants: a new kaempferol derivative from *Trianthema portulacastrum* L., *Pharmacognosy Research*, **10**: 24-30.
- Restykania, Suratman, Pitoyo, A. and Suranto. 2019, Morphology and isozyme variation among Madeira vine (*Anredera cordifolia*) accessions from southeastern Central Java, Indonesia, *Biodiversitas*, **20(10)**: 3024-3032.
- Riwanti Pramudita, I., Farizah, I. dan Anwar Medika. 2020, Pengaruh perbedaan konsentrasi etanol pada kadar flavonoid total ekstrak etanol 50, 70 dan 96% *Sargassum polycystum* dari Madura, *J-PHAM Journal of Pharmaceutical Care Anwar Medika*, **2(2)**: 82-93.
- Salceda, R. 2024, Light pollution and oxidative stress: effects on retina and human health, *Antioxidants*, **13(3)**: 362.
- Salim, A., Kristanto, D. F., Subianto, F., Sundah, J. E., Jamaica, P. A., Angelika, T. and Maulida, N. F. 2021, Phytochemical screening and therapeutic effects of Binahong (*Anredera cordifolia* (Ten.) Steenis) leaves, *Indonesian Journal of Life Sciences*, **3(2)**: 43-55.
- Sharifi-Rad, M., Anil Kumar, M. V., Zucca, P., Varoni, E. M., Dini, L., Panzarini, E., Rajkovic, J., Tsouh Fokou, P. V., Azzini, E., Peluso, I., Prakash Mishra, A., Nigam, M., El Rayess, Y., Beyrouthy, M. E., Polito, L., Iriti, M., Martins, N., Martorell, M., Docea, A. O., Setzer,

- W. N., Calina, D., Cho, W. C. and Sharifi-Rad, J. 2020, Lifestyle, oxidative stress, and antioxidants: back and forth in the pathophysiology of chronic diseases, *Frontiers in Physiology*, **11**: 1-21.
- Sianipar, M.S., Suganda, T. and Hadyarrahman, A. 2020, Effect of *Anredera cordifolia* (Ten.) Steenis leaves ethanol extract in suppressing brown planthopper (*Nilaparvata lugens*) populations on rice plant, *CROPSAVER – Journal of Plant Protection*, **3(2)**: 42.
- Da Silva, L.A.L., Pezzini, B.R. and Soares, L. 2015, Spectrophotometric determination of the total flavonoid content in *Ocimum basilicum* L. (Lamiaceae) leaves, *Pharmacognosy Magazine*, **11(41)**: 96-101.
- Siska, A.I., Rachmani, E.P.N., Widyawati, P.S., Darmakusuma, D., Kamarudin, A.P., Astuti, S.D., Budaraga, I.K., Arafah, E., Julianti, E., Lumbessy, A.S., Febriati, N., Kunarto, B. and Mutis, A. 2024, Teknologi Pengolahan Pangan Herbal, Padang: CV HEI Publishing Indonesia.
- Sidhartha, E., Yang, J.J., Dimara, R.S.N., Rahmawati, F. dan Purba, S.W.D. 2024, Phytochemical screening, antioxidant and antifungal activity test of Binahong leaf extract (*Anredera cordifolia* (Ten.) Steenis), *European Journal of Advanced Chemistry Research*, **5(1)**: 1-8.
- Souhoka, F.A., Kapelle, I.B.D. and Sihasale, E. 2021, Phytochemical and antioxidant test of Binahong (*Anredera cordifolia* (Ten.) Steenis) leaves ethanol extract, *Fullerene Journal of Chemistry*, **6(1)**: 28.
- Sun, S., Yu, Y., Jo, Y., Han, J.H., Xue, Y., Cho, M., Bae, S.-J., Ryu, D., Park, W., Ha, K.-T. and Zhuang, S. 2025, Impact of extraction techniques on phytochemical composition and bioactivity of natural product mixtures, *Frontiers in Pharmacology*, **16**.
- Suyatmi, Saleh, C. and Pratiwi, D.R. 2019, Uji fitokimia dan uji aktivitas antioksidan (metode DPPH) dari daun rambai (*Baccaurea motleyana* Mull. Arg.), *Jurnal Atomik*, **4(2)**: 96-99.
- Tumilaar, S.G., Hendriks, H., Verma, A., Osrtiz, R. and Cheng, X. 2023, A comprehensive review of free radicals, oxidative stress, and antioxidants: overview, clinical applications, global perspectives, future directions, and mechanisms of antioxidant activity of flavonoid compounds, *Journal of Chemistry*, **2024**: 1-21.
- Tungmunthum, D., Thammasart, S., Phan, T.T. and Wong, L.L. 2018, Flavonoids and other phenolic compounds from medicinal plants for

- pharmaceutical and medical aspects: an overview, *Medicines*, **5(3)**: 1-16.
- Utami, T.F.Y., Rochmah, N.N. dan Prahesti, M. 2023, Ekstrak Daun Binahong (*Anredera cordifolia* (Ten.) Steenis) sebagai Kandidat Terapi Antiinflamasi pada Inflamasi Kolon, *Indonesian Journal of Pharmacy and Natural Product*, **6**: 55-61.
- Verep, D., Ates, S. and Karaogul, E. 2023, A review of extraction methods for obtaining bioactive compounds in plant-based raw materials, *Bartın Orman Fakültesi Dergisi*, **25(3)**: 492-513.
- Wardani, K.K. 2024, Perbandingan aktivitas antioksidan ekstrak daun Binahong merah (*Anredera cordifolia*) dengan perbedaan jenis pelarut dan waktu ekstraksi, *Indonesian Journal of Health Science*, **4(2)**: 138-145.
- Yadav, N., Sharma, S., Joys, J.S. and Kumar, S. 2020, Microwave assisted extraction of bioactive compounds from medicinal plants: a review, *Journal of the Indian Chemical Society*, **97**: 1751-1756.
- Yamauchi, M., Kitamura, Y., Nagano, H., Kawatsu, J. and Gotoh, H. 2024, DPPH measurements and structure–activity relationship studies on the antioxidant capacity of phenols, *Antioxidants*, **13(3)**: 1-16.
- Zhang, X., Wei, H., Zhao, Z., Liu, J., Zhang, Q., Zhang, X. and Gu, W. 2020, The global potential distribution of invasive plants *Anredera cordifolia* under climate change and human activity based on random forest models, *Sustainability*, **12(4)**: 1-18.
- Zhang, Q.W., Lin, L.G. and Ye, W.C. 2018, Techniques for extraction and isolation of natural products: a comprehensive review, *Chinese Medicine*, **13(1)**: 1-26.