

## DAFTAR PUSTAKA

- Abdulazeez, M.A., Ibrahim, S., Ameh, D.A., Ameh, D.A., Ayo, J.O., Carvalho, L.J.C.B., Manosroi, J., and Ibrahim, A.B., 2015, Bioassay-Guided Fractionation and Antihypertensive Properties of Fractions And Crude Extracts of *Peristrophe bicalyculata* (Retz.) Nees., *Acta Pol. Pharm.*, 72, 319–28.
- Adiguna, S.P., Panggabean, J.A., Atikana, A., Untari, F., Izzati, F., Bayu, A., Rosyidah, A., Rahmawati, S.I., and Putra, M.Y., 2021, Antiviral Activities of Andrographolide and Its Derivatives: Mechanism of Action and Delivery System, *Pharmaceuticals*, 14, 1102.
- Akbarsha, M.A. and Murugaian, P., 2000, Aspects of the male reproductive toxicity/male antifertility property of andrographolide in albino rats: effect on the testis and the cauda epididymidal spermatozoa, *Phyther. Res.*, 14, 432–435.
- Akowiuh, G.A., Zhari, I., Norhayati, I., and Mariam, A., 2006, HPLC and HPTLC densitometric determination of andrographolides and antioxidant potential of *Andrographis paniculata*, *J. Food Compos. Anal.*, 19, 118–126.
- Al-Amin, M., Islam, M.M., Siddiqi, M.M.A., Akter, S., Ahmed, S., Haque, M.M., Sultana, N., and Chowdhury, A.S., 2012, Neoandrographolide Isolated from Leaves of *Adhatoda vasica* Nees, *Dhaka Univ. J. Sci.*, 60, 1–3.
- Ali, J.S., Khan, I., and Zia, M., 2020, Antimicrobial, cytotoxic, phytochemical and biological properties of crude extract and solid phase fractions of *Monothea buxifolia*, *Adv. Tradit. Med.*, 20, 115–122.
- Anonim, 2014, APPENDIX 1 – ORA Validation and Verification Guidance for Human Drug Analytical Methods, *Food Drug Adm.*, 1.7, 17–19.
- Anonim, 2018, The American Cancer Society's Oncology in Practice, John Wiley & Sons, Inc., Hoboken, NJ, USA.
- Antolovich, M., Prenzler, P.D., Patsalides, E., McDonald, S., and Robards, K., 2002, Methods for testing antioxidant activity, *Analyst*, 127, 183–198.
- Banerjee, A., Banerjee, V., Czinn, S., and Blanchard, T., 2017, Increased reactive oxygen species levels cause ER stress and cytotoxicity in andrographolide treated colon cancer cells, *Oncotarget*, 8, 26142–26153.
- Batkhuu, J., Hattori, K., Takano, F., Fushiya, S., Oshiman, K., and Fujimiya, Y., 2002, Suppression of NO Production in Activated Macrophages in Vitro and ex Vivo by Neoandrographolide Isolated from *Andrographis paniculata*., *Biol. Pharm. Bull.*, 25, 1169–1174.
- Berthod, L., Roberts, G., and Mills, G.A., 2014, A solid-phase extraction approach for the identification of pharmaceutical–sludge adsorption mechanisms, *J. Pharm. Anal.*, 4, 117–124.
- Bhan, M., Satija, S., Garg, C., Dureja, H., and Garg, M., 2017, Optimization of

ionic liquid-based microwave assisted extraction of a diterpenoid lactone-andrographolide from *Andrographis paniculata* by response surface methodology, *J. Mol. Liq.*, 229, 161–166.

- Bhullar, K., Jha, A., Youssef, D., and Rupasinghe, H., 2013, Curcumin and Its Carbocyclic Analogs: Structure-Activity in Relation to Antioxidant and Selected Biological Properties, *Molecules*, 18, 5389–5404.
- Bi, R., Deng, Y., Tang, C., Xuan, L., Xu, B., Du, Y., Wang, C., and Wei, W., 2020, Andrographolide sensitizes human renal carcinoma cells to TRAIL-induced apoptosis through upregulation of death receptor 4, *Oncol. Rep.*, 44, 1939–1948.
- Burkill, I., H., 1966, A Dictionary of the Economic Products of the Malay Peninsula, 2nd ed. Ministry of Agriculture and Co-operatives, Kuala Lumpur, Malaysia.
- Calabrese, C., Berman, S.H., Babish, J.G., Xinfang, M., Shinto, L., Dorr, M., Wells, K., Wenner, C.A., and Standish, L.J., 2000, A phase I trial of andrographolide in HIV positive patients and normal volunteers, *Phyther. Res.*, 14, 333–338.
- Cano, A., Acosta, M., and Arnao, M.B., 2000, A method to measure antioxidant activity in organic media: application to lipophilic vitamins, *Redox Rep.*, 5, 365–370.
- Carocho, M. and Ferreira, I.C.F.R., 2013, A review on antioxidants, prooxidants and related controversy: Natural and synthetic compounds, screening and analysis methodologies and future perspectives, *Food Chem. Toxicol.*, 51, 15–25.
- Chao, W.-W., Kuo, Y.-H., Li, W.-C., and Lin, B.-F., 2009, The production of nitric oxide and prostaglandin E2 in peritoneal macrophages is inhibited by *Andrographis paniculata*, *Angelica sinensis* and *Morus alba* ethyl acetate fractions, *J. Ethnopharmacol.*, 122, 68–75.
- Chao, W.-W., Kuo, Y.-H., and Lin, B.-F., 2010, Anti-inflammatory Activity of New Compounds from *Andrographis paniculata* by NF- $\kappa$ B Transactivation Inhibition, *J. Agric. Food Chem.*, 58, 2505–2512.
- Chao, W.-W. and Lin, B.-F., 2010, Isolation and identification of bioactive compounds in *Andrographis paniculata* (Chuanxinlian), *Chin. Med.*, 5, 17.
- Chao, W.W., Kuo, Y.H., and Lin, B.I.F., 2010, Anti-inflammatory activity of new compounds from *andrographis paniculata* by nf-kb transactivation inhibition, *J. Agric. Food Chem.*, 58, 2505–2512.
- Chatatikun, M. and Chiabchalard, A., 2013, Phytochemical screening and free radical scavenging activities of orange baby carrot and carrot (*Daucus carota* Linn.) root crude extracts, *J. Chem. Pharm. Res.*, 5, 97–102.
- Chatterjee, S., 2016, Oxidative Stress, Inflammation, and Disease,. In, *Oxidative Stress and Biomaterials*. Elsevier, pp. 35–58.

- Chen, L.-X., Zhuang, Y.-L., Shen, L., Ma, E.-L., Zhu, H.-J., Zhao, F., and Qiu, F., 2011, Microbial transformation of 14-deoxy-11, 12-didehydroandrographolide and 14-deoxyandrographolide and inhibitory effects on nitric oxide production of the transformation products, *J. Mol. Catal. B Enzym.*, 72, 248–255.
- Chen, M., Xie, C., and Liu, L., 2010, Solubility of Andrographolide in Various Solvents from (288.2 to 323.2) K, *J. Chem. Eng. Data*, 55, 5297–5298.
- Chia, V.V., Pang, S.F., and Gimbut, J., 2020, Mass spectrometry analysis of auxiliary energy-induced terpenes extraction from *Andrographis paniculata*, *Ind. Crops Prod.*, 155, 112828.
- Chiou, W.-F., Chen, C.-F., and Lin, J.-J., 2000, Mechanisms of suppression of inducible nitric oxide synthase (iNOS) expression in RAW 264.7 cells by andrographolide, *Br. J. Pharmacol.*, 129, 1553–1560.
- Chiou, W.-F., Lin, J.-J., and Chen, C.-F., 1998, Andrographolide suppresses the expression of inducible nitric oxide synthase in macrophage and restores the vasoconstriction in rat aorta treated with lipopolysaccharide, *Br. J. Pharmacol.*, 125, 327–334.
- Coates, D., 2003, The angiotensin converting enzyme (ACE), *Int. J. Biochem. Cell Biol.*, 35, 769–773.
- Dey, N., Mishra, K., and Dash, A.P., 2011, Andrographolide: A novel antimalarial diterpene lactone compound from *Andrographis paniculata* and its interaction with curcumin and artesunate, *J. Trop. Med.*, 2011, 1–7.
- Du, Q., Jerz, G., and Winterhalter, P., 2003, Separation of andrographolide and neoandrographolide from the leaves of *Andrographis paniculata* using high-speed counter-current chromatography, *J. Chromatogr. A*, 984, 147–151.
- Durmaz, G., 2012, Freeze-dried ABTS+ method: A ready-to-use radical powder to assess antioxidant capacity of vegetable oils, *Food Chem.*, 133, 1658–1663.
- Eggert, J., 2017, Cancer Basics, Second Edi. Oncology Nursing Society, Pittsburgh.
- Federico, A., Morgillo, F., Tuccillo, C., Ciardiello, F., and Loguercio, C., 2007, Chronic inflammation and oxidative stress in human carcinogenesis, *Int. J. Cancer*, 121, 2381–2386.
- Ferrari, R. and Boersma, E., 2013, The impact of ACE inhibition on all-cause and cardiovascular mortality in contemporary hypertension trials: a review, *Expert Rev. Cardiovasc. Ther.*, 11, 705–717.
- Fessenden, R.J. and Fessenden, J.S., 1982, Organic Chemistry, 2nd Editio. Willard Grant Press, Boston.
- Fridovich, I., 1978, The Biology of Oxygen Radicals, *Science* (80- ), 201, 875–880.
- Fyhrquist, F., Tikkanen, I., Grönhagen-Riska, C., Hortling, L., and Hichens, M., 1984, Inhibitor binding assay for angiotensin-converting enzyme., *Clin.*

*Chem.*, 30, 696–700.

- Gong, N.-B., Du, L.-D., and Lu, Y., 2018, Neoandrographolide., In, *Natural Small Molecule Drugs from Plants*. Springer Singapore, Singapore, pp. 427–431.
- Green, L.C., Wagner, D.A., Glogowski, J., Skipper, P.L., Wishnok, J.S., and Tannenbaum, S.R., 1982, Analysis of nitrate, nitrite, and [15N]nitrate in biological fluids, *Anal. Biochem.*, 126, 131–138.
- Hagerman, A.E., Riedl, K.M., Jones, G.A., Sovik, K.N., Ritchard, N.T., Hartzfeld, P.W., and Riechel, T.L., 1998, High Molecular Weight Plant Polyphenolics (Tannins) as Biological Antioxidants, *J. Agric. Food Chem.*, 46, 1887–1892.
- Hancke, J., Burgos, R., Caceres, D., and Wikman, G., 1995, A double-blind study with a new monodrug Kan Jang: Decrease of symptoms and improvement in the recovery from common colds, *Phyther. Res.*, 9, 559–562.
- Hanh, T.T.H., My, N.T.T., Cham, P.T., Quang, T.H., Cuong, N.X., Huong, T.T., Nam, N.H., and Minh, C. Van, 2020, Diterpenoids and Flavonoids from *Andrographis paniculata*, *Chem. Pharm. Bull.*, 68, 96–99.
- Hossain, M.S., Urbi, Z., and Phang, I.C., 2021, Auxin increased adventitious root development in the medicinal plant *Andrographis paniculata* (Burm. f.) Wall. ex Nees, *Agron. J.*, 113, 3222–3231.
- Hossain, M.S., Urbi, Z., Sule, A., and Rahman, K.M.H., 2014, *Andrographis paniculata* (Burm. f.) Wall. ex Nees: A Review of Ethnobotany, Phytochemistry, and Pharmacology, *Sci. World J.*, 2014, 1–28.
- Hossain, S., Urbi, Z., Karuniawati, H., Mohiuddin, R.B., Moh Qrimida, A., Allzrag, A.M.M., Ming, L.C., Pagano, E., and Capasso, R., 2021, *Andrographis paniculata* (Burm. f.) Wall. ex Nees: An Updated Review of Phytochemistry, Antimicrobial Pharmacology, and Clinical Safety and Efficacy, *Life*, 11, 348.
- Huy, N.T., Uyen, D.T., Maeda, A., Trang, D.T.X., Oida, T., Harada, S., and Kamei, K., 2007, Simple Colorimetric Inhibition Assay of Heme Crystallization for High-Throughput Screening of Antimalarial Compounds, *Antimicrob. Agents Chemother.*, 51, 350–353.
- Ibraheem, Z.O., Majid, R.A., Sidek, H.M., Noor, S.M., Yam, M.F., Abd Rachman Isnadi, M.F., and Basir, R., 2019, In Vitro Antiplasmodium and Chloroquine Resistance Reversal Effects of Andrographolide, *Evidence-Based Complement. Altern. Med.*, 2019, 1–16.
- Iruretagoyena, M.I., Tobar, J.A., González, P.A., Sepúlveda, S.E., Figueroa, C.A., Burgos, R.A., Hancke, J.L., and Kalergis, A.M., 2005, Andrographolide Interferes with T Cell Activation and Reduces Experimental Autoimmune Encephalomyelitis in the Mouse, *J. Pharmacol. Exp. Ther.*, 312, 366–372.
- Işıl Berker, K., Güçlü, K., Tor, İ., Demirata, B., and Apak, R., 2010, Total Antioxidant Capacity Assay Using Optimized Ferricyanide/Prussian Blue Method, *Food Anal. Methods*, 3, 154–168.

- Jarukamjorn, K. and Nemoto, N., 2008, Pharmacological aspects of *Andrographis paniculata* on health and its major diterpenoid constituent andrographolide, *J. Heal. Sci.*, 54, 370–381.
- Jayakumar, T., Hsieh, C.-Y., Lee, J.-J., and Sheu, J.-R., 2013, Experimental and Clinical Pharmacology of *Andrographis paniculata* and Its Major Bioactive Phytoconstituent Andrographolide, *Evidence-Based Complement. Altern. Med.*, 2013, 1–16.
- Ji, L.-L., Wang, Z., Dong, F., Zhang, W.-B., and Wang, Z.-T., 2005, Andrograpanin, a compound isolated from anti-inflammatory traditional Chinese medicine *Andrographis paniculata*, enhances chemokine SDF-1 $\alpha$ -induced leukocytes chemotaxis, *J. Cell. Biochem.*, 95, 970–978.
- Jiang, M., Sheng, F., Zhang, Z., Ma, X., Gao, T., Fu, C., and Li, P., 2021, *Andrographis paniculata* (Burm.f.) Nees and its major constituent andrographolide as potential antiviral agents, *J. Ethnopharmacol.*, 272, 113954.
- Kaushik, Sulochana, Dar, L., Kaushik, Samander, and Yadav, J.P., 2021, Identification and characterization of new potent inhibitors of dengue virus NS5 proteinase from *Andrographis paniculata* supercritical extracts on in animal cell culture and in silico approaches, *J. Ethnopharmacol.*, 267, 113541.
- Khan, I., Khan, F., Farooqui, A., and Ansari, I.A., 2018, Andrographolide Exhibits Anticancer Potential Against Human Colon Cancer Cells by Inducing Cell Cycle Arrest and Programmed Cell Death via Augmentation of Intracellular Reactive Oxygen Species Level, *Nutr. Cancer*, 70, 787–803.
- Khan, I., Mahfooz, S., Faisal, M., Alatar, A.A., and Ansari, I.A., 2020, Andrographolide Induces Apoptosis and Cell Cycle Arrest through Inhibition of Aberrant Hedgehog Signaling Pathway in Colon Cancer Cells, *Nutr. Cancer*, 0, 1–19.
- Khan, I., Yusuf, M.A., Ansari, I.A., and Akhtar, M.S., 2018, Anticancer Potential of Andrographolide, a Diterpenoid Lactone from *Andrographis paniculata*: A Nature's Treasure for Chemoprevention and Therapeutics,. In, *Anticancer Plants: Mechanisms and Molecular Interactions*. Springer Singapore, Singapore, pp. 143–163.
- Khan, M.Y. and Kumar, V., 2019, Mechanism & inhibition kinetics of bioassay-guided fractions of Indian medicinal plants and foods as ACE inhibitors, *J. Tradit. Complement. Med.*, 9, 73–84.
- Krithika, R., Verma, R.J., and Shrivastav, P.S., 2013, Antioxidative and cytoprotective effects of andrographolide against CCl<sub>4</sub>-induced hepatotoxicity in HepG2 cells, *Hum. Exp. Toxicol.*, 32, 530–543.
- Kröncke, K.-D., 2003, Nitrosative Stress and Transcription, *Biol. Chem.*, 384, .
- Kulyal, P., Tiwari, U.K., Shukla, A., and Gaur, A.K., 2010, Chemical constituents isolated from *Andrographis paniculata*, *Indian J. Chem. - Sect. B Org. Med.*



*Chem.*, 49, 356–359.

- Kumar, P., Nagarajan, A., and Uchil, P.D., 2018, Analysis of Cell Viability by the MTT Assay, 469–472.
- Kurosawa, Y., Dorn, A., Kitsuji-Shirane, M., Shimada, H., Satoh, T., Matile, H., Hofheinz, W., Masciadri, R., Kansy, M., and Ridley, R.G., 2000, Hematin Polymerization Assay as a High-Throughput Screen for Identification of New Antimalarial Pharmacophores, *Antimicrob. Agents Chemother.*, 44, 2638–2644.
- Kurzawa, M., Filipiak-Szok, A., Kłodzińska, E., and Szłyk, E., 2015, Determination of phytochemicals, antioxidant activity and total phenolic content in *Andrographis paniculata* using chromatographic methods, *J. Chromatogr. B*, 995–996, 101–106.
- de las Heras, B., Abad, M.J., Silván, A.M., Pascual, R., Bermejo, P., Rodríguez, B., and Villar, A.M., 2001, Effects of six diterpenes on macrophage eicosanoid biosynthesis, *Life Sci.*, 70, 269–278.
- Lim, X.Y., Chan, J.S.W., Tan, T.Y.C., Teh, B.P., Mohd Abd Razak, M.R., Mohamad, S., and Syed Mohamed, A.F., 2021, *Andrographis paniculata* (Burm. F.) Wall. Ex Nees, Andrographolide, and Andrographolide Analogues as SARS-CoV-2 Antivirals? A Rapid Review, *Nat. Prod. Commun.*, 16, 1934578X2110166.
- Liu, J., Wang, Z.-T., and Ge, B.-X., 2008, Andrograpanin, isolated from *Andrographis paniculata*, exhibits anti-inflammatory property in lipopolysaccharide-induced macrophage cells through down-regulating the p38 MAPKs signaling pathways, *Int. Immunopharmacol.*, 8, 951–958.
- Liu, J., Wang, Z.-T., and Ji, L.-L., 2007, In Vivo and In Vitro Anti-inflammatory Activities of Neoandrographolide, *Am. J. Chin. Med.*, 35, 317–328.
- Liu, J., Wang, Z.-T., Ji, L.-L., and Ge, B.-X., 2007, Inhibitory effects of neoandrographolide on nitric oxide and prostaglandin E2 production in LPS-stimulated murine macrophage, *Mol. Cell. Biochem.*, 298, 49–57.
- Masqué, N., Marcé, R., and Borrull, F., 1998, New polymeric and other types of sorbents for solid-phase extraction of polar organic micropollutants from environmental water, *TrAC Trends Anal. Chem.*, 17, 384–394.
- van Meerloo, J., Kaspers, G.J.L., and Cloos, J., 2011, Cell Sensitivity Assays: The MTT Assay, pp. 237–245.
- Meng, Q.C., Balcells, E., Dell'Italia, L., Durand, J., and Oparil, S., 1995, Sensitive method for quantitation of angiotensin-converting enzyme (ACE) activity in tissue, *Biochem. Pharmacol.*, 50, 1445–1450.
- Meyer, V.R., 2013, *Practical High-Performance Liquid Chromatography*, fifth edit. John Wiley & Sons, Ltd, United Kingdom.
- Miller, N.J., Rice-Evans, C., Davies, M.J., Gopinathan, V., and Milner, A., 1993,

A Novel Method for Measuring Antioxidant Capacity and its Application to Monitoring the Antioxidant Status in Premature Neonates, *Clin. Sci.*, 84, 407–412.

- Molina-Díaz, A., 1998, Indirect spectrophotometric determination of ascorbic acid with ferrozine by flow-injection analysis, *Talanta*, 47, 531–536.
- Monsur, A., Nor, M., Abdullah-Al-Maswood, Md., Abdul Aziz, Md., Ashraful Alam, Md., S.H., Md., R.I., and Md., G.U., 2020, Comparison of antioxidant role of methanol, acetone and water extracts of *Andrographis paniculata* Nees, *J. Med. Plants Res.*, 14, 428–437.
- Munteanu, I.G. and Apetrei, C., 2021, Analytical Methods Used in Determining Antioxidant Activity: A Review, *Int. J. Mol. Sci.*, 22, 3380.
- Nathan, C., 2003, Specificity of a third kind: reactive oxygen and nitrogen intermediates in cell signaling, *J. Clin. Invest.*, 111, 769–778.
- Navis, G., Faber, H.J., de Zeeuw, D., and de Jong, P.E., 1996, ACE Inhibitors and the Kidney, *Drug Saf.*, 15, 200–211.
- Omodeo-Salè, F., Cortelezzi, L., Basilico, N., Casagrande, M., Sparatore, A., and Taramelli, D., 2009, Novel Antimalarial Aminoquinolines: Heme Binding and Effects on Normal or Plasmodium falciparum -Parasitized Human Erythrocytes, *Antimicrob. Agents Chemother.*, 53, 4339–4344.
- Onyoh, E.F., Hsu, W.-F., Chang, L.-C., Lee, Y.-C., Wu, M.-S., and Chiu, H.-M., 2019, The Rise of Colorectal Cancer in Asia: Epidemiology, Screening, and Management, *Curr. Gastroenterol. Rep.*, 21, 36.
- Poole, C.F., 2003, New trends in solid-phase extraction, *TrAC Trends Anal. Chem.*, 22, 362–373.
- Poyton, R.O., Ball, K.A., and Castello, P.R., 2009, Mitochondrial generation of free radicals and hypoxic signaling, *Trends Endocrinol. Metab.*, 20, 332–340.
- Pramanick, S., Banerjee, S., Achari, B., Das, B., Sen, A.K., Mukhopadhyay, S., Neuman, A., and Prangé, T., 2006, Andropanolide and Isoandrographolide, Minor Diterpenoids from *Andrographis paniculata*: Structure and X-ray Crystallographic Analysis 1, *J. Nat. Prod.*, 69, 403–405.
- Prior, R.L., Wu, X., and Schaich, K., 2005, Standardized Methods for the Determination of Antioxidant Capacity and Phenolics in Foods and Dietary Supplements, *J. Agric. Food Chem.*, 53, 4290–4302.
- Rafat, A., Philip, K., and Muniandy, S., 2010, Antioxidant potential and content of phenolic compounds in ethanolic extracts of selected parts of *Andrographis paniculata*, *J. Med. Plants Res.*, 4, 197–202.
- Rafi, M., Devi, A.F., Syafitri, U.D., Heryanto, R., Suparto, I.H., Amran, M.B., Rohman, A., Prajogo, B., and Lim, L.W., 2020, Classification of *Andrographis paniculata* extracts by solvent extraction using HPLC fingerprint and chemometric analysis, *BMC Res. Notes*, 13, 1–7.

- Rafi, M., Septningsih, D.A., Karomah, A.H., Lukman, L., Prajogo, B., Amran, M.B., and Rohman, A., 2021, Inhibition of  $\alpha$ -glucosidase activity, metals content, and phytochemical profiling of *Andrographis paniculata* from different geographical origins based on FTIR and UHPLC-Q-Orbitrap HRMS metabolomics, *Biodiversitas J. Biol. Divers.*, 22, 1535–1542.
- Rajeev, K., Arun, K., Ramji, S., and Atul, B., 2010, Pharmacological review on Natural ACE inhibitors, *Der Pharm. Lett.*, 2, 273–293.
- Rao, P.R. and Rathod, V.K., 2015, Rapid extraction of andrographolide from *Andrographis paniculata* Nees by three phase partitioning and determination of its antioxidant activity, *Biocatal. Agric. Biotechnol.*, 4, 586–593.
- Reuter, S., Gupta, S.C., Chaturvedi, M.M., and Aggarwal, B.B., 2010, Oxidative stress, inflammation, and cancer: How are they linked?, *Free Radic. Biol. Med.*, 49, 1603–1616.
- Rosidah, I., Sumaryono, W., and Surini, S., 2014, Peningkatan Kelarutan Andrografolid dalam Fraksi Etil Asetat Herba Sambiloto (*Andrographis paniculata* Nees) Melalui Mikroenkapsulasi dengan Metode Semprot Kering, *J. Ilmu Kefarmasian Indones.*, 12, 80–92.
- Royle, L., Campbell, M.P., Radcliffe, C.M., White, D.M., Harvey, D.J., Abrahams, J.L., Kim, Y.-G., Henry, G.W., Shadick, N.A., Weinblatt, M.E., Lee, D.M., Rudd, P.M., and Dwek, R.A., 2008, HPLC-based analysis of serum N-glycans on a 96-well plate platform with dedicated database software, *Anal. Biochem.*, 376, 1–12.
- Saha, K., Lajis, N., Israf, D., Hamzah, A., Khozirah, S., Khamis, S., and Syahida, A., 2004, Evaluation of antioxidant and nitric oxide inhibitory activities of selected Malaysian medicinal plants, *J. Ethnopharmacol.*, 92, 263–267.
- Saritha, M., Koringa, K., Dave, U., and Gatne, D., 2015, A modified precise analytical method for anti-malarial screening: Heme polymerization assay, *Mol. Biochem. Parasitol.*, 201, 112–115.
- Saxena, R.C., Singh, R., Kumar, P., Yadav, S.C., Negi, M.P.S., Saxena, V.S., Joshua, A.J., Vijayabalaji, V., Goudar, K.S., Venkateshwarlu, K., and Amit, A., 2010, A randomized double blind placebo controlled clinical evaluation of extract of *Andrographis paniculata* (KalmCold™) in patients with uncomplicated upper respiratory tract infection, *Phytomedicine*, 17, 178–185.
- Sekhon-Loodu, S. and Rupasinghe, H.P.V., 2019, Evaluation of Antioxidant, Antidiabetic and Antiobesity Potential of Selected Traditional Medicinal Plants, *Front. Nutr.*, 6, .
- Shahidi, F. and Zhong, Y., 2015, Measurement of antioxidant activity, *J. Funct. Foods*, 18, 757–781.
- Sharma, S. and Sharma, Y.P., 2018, Comparison of different extraction methods and HPLC method development for the quantification of andrographolide from *Andrographis paniculata* (Burm.f.) Wall. ex Nees, *Ann. Phytomedicine*



*An Int. J.*, 7, 119–130.

- Siddeeg, A., AlKehayez, N.M., Abu-Hiamed, H.A., Al-Sanea, E.A., and AL-Farga, A.M., 2021, Mode of action and determination of antioxidant activity in the dietary sources: An overview, *Saudi J. Biol. Sci.*, 28, 1633–1644.
- Srivastava, A., Misra, H., Verma, R.K., and Gupta, M.M., 2004, Chemical fingerprinting of *Andrographis paniculata* using HPLC, HPTLC and densitometry, *Phytochem. Anal.*, 15, 280–285.
- Sun, X., Yan, H., Zhang, Y., Wang, X., Qin, D., and Yu, J., 2019, Preparative Separation of Diterpene Lactones and Flavones from *Andrographis paniculata* Using Off-Line Two-Dimensional High-Speed Counter-Current Chromatography, *Molecules*, 24, 620.
- Suresh, K., Goud, N.R., and Nangia, A., 2013, Andrographolide: Solving chemical instability and poor solubility by means of cocrystals, *Chem. - An Asian J.*, 8, 3032–3041.
- Suriyo, T., Pholphana, N., Rangkadilok, N., Thiantanawat, A., Watcharasit, P., and Satayavivad, J., 2014, *Andrographis paniculata* extracts and major constituent diterpenoids inhibit growth of intrahepatic cholangiocarcinoma cells by inducing cell cycle arrest and apoptosis, *Planta Med.*, 80, 533–543.
- Syamsuhidayat, S.S. and Hutapea, J.R., 1991, *Inventaris Tanaman Obat Indonesia*, Departemen Kesehatan RI, Badan Penelitian dan Pengembangan Kesehatan, Jakarta.
- Tajidin, N.E., Shaari, K., Maulidiani, M., Salleh, N.S., Ketaren, B.R., and Mohamad, M., 2019, Metabolite profiling of *Andrographis paniculata* (Burm. f.) Nees. young and mature leaves at different harvest ages using <sup>1</sup>H NMR-based metabolomics approach, *Sci. Rep.*, 9, 1–10.
- Tang, J., Dunshea, F.R., and Suleria, H.A.R., 2019, LC-ESI-QTOF/MS Characterization of Phenolic Compounds from Medicinal Plants (Hops and Juniper Berries) and Their Antioxidant Activity, *Foods*, 9, 7.
- Toh, S.Q., Glanfield, A., Gobert, G.N., and Jones, M.K., 2010, Heme and blood-feeding parasites: friends or foes?, *Parasit. Vectors*, 3, 108.
- Tsikas, D., Gutzki, F.-M., and Stichtenoth, D.O., 2006, Circulating and excretory nitrite and nitrate as indicators of nitric oxide synthesis in humans: methods of analysis, *Eur. J. Clin. Pharmacol.*, 62, 51–59.
- Valko, M., Leibfritz, D., Moncol, J., Cronin, M.T.D., Mazur, M., and Telser, J., 2007, Free radicals and antioxidants in normal physiological functions and human disease, *Int. J. Biochem. Cell Biol.*, 39, 44–84.
- Varma, A., Padh, H., and Shrivastava, N., 2011, Andrographolide: A New Plant-Derived Antineoplastic Entity on Horizon, *Evidence-Based Complement. Altern. Med.*, 2011, 1–9.
- Wang, Y., Chen, L., Zhao, F., Liu, Z., Li, J., and Qiu, F., 2011, Microbial

transformation of neoandrographolide by *Mucor spinosus* (AS 3.2450), *J. Mol. Catal. B Enzym.*, 68, 13.

- Widyawaruyanti, A., Asrory, M., Ekasari, W., Setiawan, D., Radjaram, A., Tumewu, L., and Hafid, A.F., 2014, In vivo Antimalarial Activity of *Andrographis Paniculata* Tablets, *Procedia Chem.*, 13, 101–104.
- Wongkittipong, R., Prat, L., Damronglerd, S., and Gourdon, C., 2004, Solid-liquid extraction of andrographolide from plants-experimental study, kinetic reaction and model, *Sep. Purif. Technol.*, 40, 147–154.
- Xiang, J., Apea-Bah, F.B., Ndolo, V.U., Katundu, M.C., and Beta, T., 2019, Profile of phenolic compounds and antioxidant activity of finger millet varieties, *Food Chem.*, 275, 361–368.
- Yusof, N.A., Isha, A., Ismail, I.S., Khatib, A., Shaari, K., Abas, F., and Rukayadi, Y., 2015, Infrared-metabolomics approach in detecting changes in *Andrographis paniculata* metabolites due to different harvesting ages and times, *J. Sci. Food Agric.*, 95, 2533–2543.
- Zhang, C. and Tan, B., 1996, Hypotensive Activity Of Aqueous Extract of *Andrographis Paniculata* in Rats, *Clin. Exp. Pharmacol. Physiol.*, 23, 675–678.
- Zhang, C.Y. and Tan, B.K.H., 1997, Mechanisms of cardiovascular activity of *Andrographis paniculata* in the anaesthetized rat, *J. Ethnopharmacol.*, 56, 97–101.
- Zhang, J., Sun, Y., Zhong, L.-Y., Yu, N.-N., Ouyang, L., Fang, R.-D., Wang, Y., and He, Q.-Y., 2020, Structure-based discovery of neoandrographolide as a novel inhibitor of Rab5 to suppress cancer growth, *Comput. Struct. Biotechnol. J.*, 18, 3936–3946.
- Ziegler, J., Linck, R., and Wright, D., 2001, Heme Aggregation Inhibitors: Antimalarial Drugs Targeting an Essential Biomineralization Process, *Curr. Med. Chem.*, 8, 171–189.