

## DAFTAR PUSTAKA

- Abu-Ghefreh, A.A., Canatan, H., dan Ezeamuzie, C.I., 2009. In vitro and in vivo anti-inflammatory effects of andrographolide. *International Immunopharmacology*, **9**: 313–318.
- Albuquerque, B.R., Prieto, M.A., Barreiro, M.F., Rodrigues, A., Curran, T.P., Barros, L., dkk., 2016. Catechin-based extract optimization obtained from *Arbutus unedo* L. fruits using maceration/microwave/ultrasound extraction techniques. *Industrial Crops and Products*, .
- Anju, dhiman, Jugnu, G., Kavita, S., Arun, N., dan Sandeep, D., 2012. A Review on medicinal prospective of *Andrographis paniculata* Ness. *Journal of Pharmaceutical and scientific Innovation*, **1**: 1–4.
- Antolovich, M., Prenzler, P.D., Patsalides, E., McDonald, S., dan Robards, K., 2002. Methods for testing antioxidant activity. *The Analyst*, **127**: 183–198.
- Ariastuti, R., 2017. 'Aktivitas Antidiabetes Ekstrak Terpurifikasi Herba Pegagan (*Centella asiatica*)(L.) Urban) dan Herba Sambiloto (*Andrographis paniculata*) (burm.f) Ness) pada Tikus Diabetes Mellitus Tipe 2 Defisiensi Insulin', , *Tesis*, . Universitas Gadjah Mada, Fakultas Farmasi.
- Badan POM RI, 2008. *Taksonomi Koleksi Tanaman Obat Kebun Tanaman Obat Citeureup*. Badan Pengawas Obat dan Makanan Republik Indonesia Deputi Bidang Pengawasan Obat Tradisional, Kosmetik, dan Produk Komplemen Dir ektorat Obat Asli Indonesia.
- Benoy, G.K., Animesh, D.K., Aninda, M., Priyanka, D.K., dan Sandip, H., 2012. An overview on *Andrographis paniculata* (Burm. F.) Nees. *Int. J. Res. Ayur. Pharm*, **3**: 752–762.
- Bisswanger, H., 2014. Enzyme assays. *Perspectives in Science*, **1**: 41–55.
- Brunetti, C., Di Ferdinando, M., Fini, A., Pollastri, S., dan Tattini, M., 2013. Flavonoids as Antioxidants and Developmental Regulators: Relative Significance in Plants and Humans. *International Journal of Molecular Sciences*, **14**: 3540–3555.

Chauhan, P.K., Pandey, I.P., dan Dhatwalia, V.K., 2010a. Evaluation of the anti-diabetic effect of ethanolic and methanolic extracts of *Centella asiatica* leaves extract on alloxan induced diabetic rats. *Adv Biol Res*, **4**: 27–30.

Chen, L.-X., He, H., Xia, G.-Y., Zhou, K.-L., dan Qiu, F., 2014. A new flavonoid from the aerial parts of *Andrographis paniculata*. *Natural Product Research*, **28**: 138–143.

Das, A.J., 2011. Review on Nutritional, Medicinal and Pharmacological Properties of *Centella asiatica* ( *Indian pennywort* ). *Journal of Biologically Active Products from Nature*, **1**: 216–228.

Deepak, S., Pawar, A., dan Shinde, P., 2014. Study of antioxidant and antimicrobial activities of *Andrographis paniculata*. *Asian Journal of Plant Science and Research*, **4**: 31–41.

DEPKES RI, 2008. *Farmakope Herbal Indonesia*. Departemen Kesehatan Republik Indonesia, Jakarta.

Dewi, R.T. dan Maryani, F., 2015. Antioxidant and  $\alpha$ -Glucosidase Inhibitory Compounds of *Centella asiatica*. *Procedia Chemistry*, **17**: 147–152.

Dua, V.K., Ojha, V.P., Roy, R., Joshi, B.C., Valecha, N., Devi, C.U., dkk., 2004. Anti-malarial activity of some xanthenes isolated from the roots of *Andrographis paniculata*. *Journal of Ethnopharmacology*, **95**: 247–251.

Emran, T.B., Dutta, M., Uddin, M.M.N., Nath, A.K., dan Uddin, M.Z., 2016. Antidiabetic potential of the leaf extract of *Centella asiatica* in alloxaninduced diabetic rats. *Jahangirnagar University Journal of Biological Sciences*, **4**: 51–59.

Gray, G., 1975. Carbohydrate digestion and absorption. *Physiology in medicine*, **292**: 1225–1230.

Gülçin, I., Mshvildadze, V., Gepdiremen, A., dan Elias, R., 2004. Antioxidant activity of saponins isolated from ivy: alpha-hederin, hederasaponin-C, hederacolchiside-E and hederacolchiside-F. *Planta Medica*, **70**: 561–563.

Gülçin, İ., Mshvildadze, V., Gepdiremen, A., dan Elias, R., 2006. Screening of antiradical and antioxidant activity of monodesmosides and crude extract from *Leontice smirnowii* tuber. *Phytomedicine*, **13**: 343–351.

Halliwell, B., Gutteridge, J.M., dan Cross, C.E., 1992. Free radicals, antioxidants, and human disease: where are we now? *The Journal of Laboratory and Clinical Medicine*, **119**: 598–620.

Heyne, K., 1987. *Tumbuhan Berguna Indonesia*, Terj. Badan Litbang Kehutanan, I. ed. Koperasi Karyawan Depatemen Kehutanan, Jakarta Pusat.

Hidalgo, M.A., Hancke, J.L., Bertoglio, J.C., dan Burgos, R.A., 2013. Andrographolide a New Potential Drug for the Long Term Treatment of Rheumatoid Arthritis Disease, dalam: Matsuno, H. (Editor), *Innovative Rheumatology*. InTech.

Hong, H.-C., Li, S.-L., Zhang, X.-Q., Ye, W.-C., dan Zhang, Q.-W., 2013. Flavonoids with  $\alpha$ -glucosidase inhibitory activities and their contents in the leaves of *Morus atropurpurea*. *Chinese Medicine*, **8**: 19.

Ichite, N., Chougule, M.B., Jackson, T., Fulzele, S.V., Safe, S., dan Singh, M., 2009. Enhancement of Docetaxel Anticancer Activity by a Novel Diindolylmethane Compound in Human Non-Small Cell Lung Cancer. *Clinical Cancer Research*, **15**: 543–552.

International Diabetes Federation, 2015. *IDF DIABETES ATLAS*, VII. ed. International Diabetes Federation.

Jamil, S.S., Nizami, Q., dan Salam, M., 2007. *Centella asiatica* (Linn.) Urban óA Review. *Natural Product Radiance*, **6(2)**: 158–170.

Jun, M., Fu, H.-Y., Hong, J., Wan, X., Yang, C.S., dan Ho, C.-T., 2003. Comparison of Antioxidant Activities of Isoflavones from Kudzu Root (*Pueraria lobata* Ohwi). *Journal of Food Science*, **68**: 2117–2122.

KEMENKES, 2013. *Riset Kesehatan Dasar (RISKESDAS 2013)*. Balai Penelitian dan Pengembangan Kesehatan.

Ketut Ristiana, 2000. *Parameter Standar Umum Ekstrak Tumbuhan Obat*. Dirjen BPPOM, Jakarta.

Kikuzaki, H., Hisamoto, M., Hirose, K., Akiyama, K., dan Taniguchi, H., 2002. Antioxidant Properties of Ferulic Acid and Its Related Compounds. *Journal of Agricultural and Food Chemistry*, **50**: 2161–2168.

Kim, J.-S., Kwon, C.-S., dan Son, K. ho, 2000. Inhibition of Alpha-Glucosidase and amylase by luteolin, a Flavonoid. *Bioscience, Biotechnology, and Biochemistry*, **64**: 2458–2461.

Koteswara Rao, Y., Vimalamma, G., Venkata Rao, C., dan Tzeng, Y.-M., 2004. Flavonoids and andrographolides from *Andrographis paniculata*. *Phytochemistry*, **65**: 2317–2321.

Kumar, S. dan Pandey, A.K., 2013. Chemistry and Biological Activities of Flavonoids: An Overview. *The Scientific World Journal*, **2013**: 1–16.

Kumoro, A.C. dan Hasan, M., 2007. Supercritical Carbon Dioxide Extraction of Andrographolide from *Andrographis paniculata*: Effect of the Solvent Flow Rate, Pressure, and Temperature\*\* Supported by the Intensification of Research in Priority Areas Project (IRPA), Ministry of Science, Technology and Innovation, Malaysia (No. 09-02-03-0101-EA0001). *Chinese Journal of Chemical Engineering*, **15**: 877–883.

Lebovitz, H.E., 1997. Alpha-glucosidase inhibitors. *Endocrinology and metabolism clinics of North America*, **26**: 539–551.

Lin, F.L., Wu, S.J., Lee, S.C., dan Ng, L.T., 2009. Antioxidant, antioedema and analgesic activities of *Andrographis paniculata* extracts and their active constituent andrographolide. *Phytotherapy Research*, **23**: 958–964.

Luo, L., Wang, R., Wang, X., Ma, Z., dan Li, N., 2012. Compounds from *Angelica keiskei* with NQO1 induction, DPPH scavenging and  $\alpha$ -glucosidase inhibitory activities. *Food Chemistry*, **131**: 992–998.

Maleš, Ž. dan Medić-Šarić, M., 2001. Optimization of TLC analysis of flavonoids and phenolic acids of *Helleborus atrorubens* Waldst. et Kit. *Journal of Pharmaceutical and Biomedical Analysis*, **24**: 353–359.

Marques, N.F., Stefanello, S.T., Froeder, A.L.F., Busanello, A., Boligon, A.A., Athayde, M.L., dkk., 2015. *Centella asiatica* and Its Fractions Reduces Lipid Peroxidation Induced by Quinolinic Acid and Sodium Nitroprusside in Rat Brain Regions. *Neurochemical Research*, **40**: 1197–1210.

Molyneux, P., 2003. The use of the stable free radical diphenylpicryl- hydrazyl (DPPH) for estimating antioxidant activity 9.

Nugroho, A., Warditiani, N., Pramono, S., Andrie, M., Siswanto, E., dan Lukitaningsih, E., 2012. Antidiabetic and antihyperlipidemic effect of *Andrographis paniculata* (Burm. f.) Nees and andrographolide in high-fructose-fat-fed rats. *Indian Journal of Pharmacology*, **44**: 377.

Nugroho, A.E., 2011. *Farmakologi Obat-Obat Penting Dalam Pembelajaran Ilmu Farmasi Dan Dunia Kesehatan*. Pustaka Pelajar, Yogyakarta.

Nugroho, A.E., Andrie, M., Susilowati, R., Nurrochmad, A., dan Lukitaningsih, E., 2011. Ethanolic Extracts Of A. *Paniculata* (burm. f.) Nees And Its Active Compound, Andrographolide, Decrease The Expression Of Glucose Transporters (glut 4) In High Fuctose-Fat Fed Rats 12.

Nugroho, A.E., Kusumaramdani, G., Widyaninggar, A., Prasetyo Anggoro, D., dan Pramono, S., 2014. Antidiabetic effect of combinations of n-hexane insoluble fraction of ethanolic extract of *Andrographis paniculata* with other traditional medicines. *International Food Research Journal*, **21**: .

Nugroho, A.E., Lindawati, N.Y., Herlyanti, K., Widyastuti, L., dan Pramono, S., 2013. Anti-diabetic effect of a combination of andrographolide-enriched extract of *Andrographis paniculata* (Burm f.) Nees and asiaticoside-enriched extract of *Centella asiatica* L. in high fructose-fat fed rats. *INDIAN J EXP BIOL*, **8**.

Oki, T., Matsui, T., dan Osajima, Y., 1999. Inhibitory Effect of  $\alpha$ -Glucosidase Inhibitors Varies According to Its Origin. *Journal of Agricultural and Food Chemistry*, **47**: 550–553.

Orhan, I.E., 2012. *Centella asiatica* (L.) Urban: From Traditional Medicine to Modern Medicine with Neuroprotective Potential. *Evidence-Based Complementary and Alternative Medicine*, **2012**: 1–8.

Patel, H.D., Shah, G.B., dan Trivedi, V., 2011. Investigation of HMG Co A Reductase Inhibitory Activity of Antihyperlipidemic Herbal Drugs Study In Vitro. *ASIAN J. EXP. BIOL.*, .

Pholphana, N., Rangkadilok, N., Thongnest, S., Ruchirawat, S., Ruchirawat, M., dan Satayavivad, J., 2004. Determination and variation of three active diterpenoids in *Andrographis paniculata* (Burm.f.) Nees. *Phytochemical Analysis*, **15**: 365–371.

Pittella, F., Dutra, R., Junior, D., Lopes, M.T., dan Barbosa, N., 2009. Antioxidant and Cytotoxic Activities of *Centella asiatica* (L) Urb. *International Journal of Molecular Sciences*, **10**: 3713–3721.

Poedjiadi, A. dan Supriyanti, F.M. titin, 2012. *Dasar-Dasar Biokimia*. UI-Press, Jakarta.

Pokorny, J., Ynishlieva, N., dan Gordon, M., 2001. *Antioxidants in Food Practical Applications*. Woodhead Publishing Ltd, Cambridge ; England.

Prabhakar Reddy, P., Tiwari, A.K., Ranga Rao, R., Madhusudhana, K., Rama Subba Rao, V., Ali, A.Z., dkk., 2009. New Labdane diterpenes as intestinal  $\alpha$ -glucosidase inhibitor from antihyperglycemic extract of *Hedychium spicatum* (Ham. Ex Smith) rhizomes. *Bioorganic & Medicinal Chemistry Letters*, **19**: 2562–2565.

Prakash, A., Rigelhof, F., dan Miller, E., 2001. Antioxidant activity. *Medallion laboratories analytical progress*, **19**: 1–4.

Pramono, S., 1992. Profil kromatogram ekstrak herba pegagan yang berefek antihipertensi. *Warta Tumbuhan Obat Indonesia*, **1**: .

Premanath, R. dan Nanjaiah, L., 2015. Antidiabetic and Antioxidant potential of *Andrographis paniculata* Nees. leaf ethanol extract in streptozotocin induced diabetic rats. *Journal of Applied Pharmaceutical Science*, .

Proença, C., Freitas, M., Ribeiro, D., Oliveira, E.F.T., Sousa, J.L.C., Tomé, S.M., dkk., 2017.  $\alpha$ -Glucosidase inhibition by flavonoids: an *in vitro* and *in silico* structure–activity relationship study. *Journal of Enzyme Inhibition and Medicinal Chemistry*, **32**: 1216–1228.



Rahayu, M. dan Setyowati, F.M., 1996. Etnobotani sambiloto, pemanfaatannya sebagai bahan obat tradisional. *Warta Tumbuhan Obat Indonesia*, **3**: .

Rais, I.R., Samudra, A.G., Widyarini, S., dan Nugroho, A.E., 2013. determination of andrographolide isolate activity to  $\alpha$ -amylase and  $\alpha$ -glucosidase using apostolidis and mayur method. *Traditional Medicine Journal*, **18**: 162–166.

Rajani, M., Shrivastava, N., dan Ravishankara, M.N., 2000. A rapid method for isolation of andrographolide from *Andrographis paniculata* Nees (Kalmegh). *Pharmaceutical biology*, **38**: 204–209.

Rosak, C. dan Mertes, 2012. Critical evaluation of the role of acarbose in the treatment of diabetes: patient considerations. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, 357.

Safdar, M.N., Kausar, T., Jabbar, S., Mumtaz, A., Ahad, K., dan Saddozai, A.A., 2016. Extraction and quantification of polyphenols from kinnow (*Citrus reticulata* L.) peel using ultrasound and maceration techniques. *Journal of Food and Drug Analysis*, .

Saltos, M.B.V., Puente, B.F.N., Faraone, I., Milella, L., Tommasi, N.D., dan Braca, A., 2015. Inhibitors of  $\alpha$ -amylase and  $\alpha$ -glucosidase from *Andromachia igniaria* Humb. & Bonpl. *Phytochemistry Letters*, **14**: 45–50.

Sasikala, S., Lakshminarasiah, S., dan Naidu, M.D., 2015. Antidiabetic activity of *Centella asiatica* on streptozotocin induced diabetic male albino rats. *World Journal of Pharmaceutical Sciences*, **3**: 1701–1705.

Shaw, J.E., Sicree, R.A., dan Zimmet, P.Z., 2010. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Research and Clinical Practice*, **87**: 4–14.

Subban, R., Veerakumar, A., Manimaran, R., Hashim, K.M., dan Balachandran, I., 2008. Two new flavonoids from *Centella asiatica* (Linn.). *Journal of Natural Medicines*, **62**: 369–373.

Subramanian, R., Asmawi, M.Z., dan Sadikun, A., 2008. In vitro alpha-glucosidase and alpha-amylase enzyme inhibitory effects of *Andrographis paniculata* extract and andrographolide. *Acta Biochim Pol*, **55**: 391–398.

Subramanian, R., Subbramaniyan, P., Noorul Ameen, J., dan Raj, V., 2016. Double bypasses soxhlet apparatus for extraction of piperine from *Piper nigrum*. *Arabian Journal of Chemistry*, **9**: S537–S540.

Supkamonseni, N., Thinkratok, A., Meksuriyen, D., dan Srisawat, R., 2014. Hypolipidemic and hypoglycemic effects of *Centella asiatica* (L.) extract in vitro and in vivo. *Indian Journal of Experimental Biology*, **52**: 965–971.

Susanti, N.M.P., Warditiani, N.K., dan Wirasuta, I.M.A.G., 2017. antioxidant activity test of andrographolide in bitter herbs using DPPH Scavenging. *JHSM UNUD Journals*, **1**: 9–11.

Tadera, K., Minami, Y., Takamatsu, K., dan Matsuoka, T., 2006. Inhibition of alfa Glucosidase and alfa Amylase by Flavonoids. *J Nutr Sci Vitaminol*, **52**: 5.

Takaya, Y., Kondo, Y., Furukawa, T., dan Niwa, M., 2003. Antioxidant constituents of radish sprout (*Kaiware-daikon*), *Raphanus sativus* L. *Journal of Agricultural and Food Chemistry*, **51**: 8061–8066.

Verma, N. dan Vinayak, M., 2008. Antioxidant action of *Andrographis paniculata* on lymphoma. *Molecular Biology Reports*, **35**: 535–540.

Verma, V.K., Sarwa, K.K., Kumar, A., dan Zaman, M.K., 2013. Comparison of hepatoprotective activity of *Swertia chirayita* and *Andrographis paniculata* plant of North–East India against CCl<sub>4</sub> induced hepatotoxic rats. *Journal of Pharmacy Research*, **7**: 647–653.

Widyawati, T., 2007. 'Aspek Farmakologi Sambiloto (*Andrographis paniculata* Nees)', . *Majalah Kedokteran Nusantara*, 216–222.

Winarsi, H., 2011. *Antioksidan Alami Dan Radikal Bebas*. Kanisius Yogyakarta.

Xu, C., Chou, G.X., dan Wang, Z.T., 2010. A new diterpene from the leaves of *Andrographis paniculata* Nees. *Fitoterapia*, **81**: 610–613.



- Xu, H., 2010. Inhibition Kinetics of Flavonoids on Yeast alfa Glucosidase Merged with Docking Simulations. *Bentham Science Publishers Ltd*, **17**: 1270–1279.
- Xu, Y., Guo, Y., Gao, Y., Niu, X., Wang, L., Li, X., dkk., 2018a. Seperation, characterization and inhibition on  $\alpha$  -glucosidase,  $\alpha$  -amylase and glycation of a polysaccharide from blackcurrant fruits. *LWT*, **93**: 16–23.
- Xu, Y., Niu, X., Liu, N., Gao, Y., Wang, L., Xu, G., dkk., 2018b. Characterization, antioxidant and hypoglycemic activities of degraded polysaccharides from blackcurrant ( *Ribes nigrum* L.) fruits. *Food Chemistry*, **243**: 26–35.
- Yang, Y., Gu, L., Xiao, Y., Liu, Q., Hu, H., Wang, Z., dkk., 2015. Rapid Identification of  $\alpha$ -Glucosidase Inhibitors from *Phlomis tuberosa* by Sepbox Chromatography and Thin-Layer Chromatography Bioautography. *PLOS ONE*, **10**: e0116922.
- Yin, Z., Zhang, W., Feng, F., Zhang, Y., dan Kang, W., 2014.  $\alpha$ -Glucosidase inhibitors isolated from medicinal plants. *Food Science and Human Wellness*, **3**: 136–174.
- Ying, Y.-M., Zhang, L.-Y., Zhang, X., Bai, H.-B., Liang, D.-E., Ma, L.-F., dkk., 2014. Terpenoids with alpha-glucosidase inhibitory activity from the submerged culture of *Inonotus obliquus*. *Phytochemistry*, **108**: 171–176.
- Zhang, J.-F., Zheng, Y.-G., dan Shen, Y.-C., 2007. Inhibitory effect of valienamine on the enzymatic activity of honeybee (*Apis cerana* Fabr.)  $\alpha$ -glucosidase. *Pesticide Biochemistry and Physiology*, **87**: 73–77.
- Zhang, L., Li, H., Gong, X., Luo, F., Wang, B., Hu, N., dkk., 2010. Protective effects of Asiaticoside on acute liver injury induced by lipopolysaccharide/D-galactosamine in mice. *Phytomedicine*, **17**: 811–819.
- Zhang, X.-F. dan Tan, B. kwong-Huat, 2000. Anti-diabetic property of ethanolic extract of *Andrographis paniculata* in streptozotocin-diabetic rat. *Acta Pharmacol Sin*, **21**: 1157–1164.



UNIVERSITAS  
GADJAH MADA

**UJI AKTIVITAS PENGHAMBATAN ENZIM ALFA GLUKOSIDASE DAN AKTIVITAS ANTIOKSIDAN  
EKSTRAK, FRAKSI SERTA  
KOMBINASI FRAKSI AKTIF HERBA SAMBILOTO (*Andrographis paniculata* (Burm.f.) Ness) DAN  
FRAKSI AKTIF**

**HERBA PEGAGAN (*Centella asiatica* (L.) Urban)**

ARMAN RUSMAN, Prof. Dr. Agung Endro Nugroho, M.Si., Apt.; Prof. Dr. Suwidjiyo Pramono, DEA., Apt.

Universitas Gadjah Mada, 2018 | Diunduh dari <http://etd.repository.ugm.ac.id/>

Zhang, Y., Xiao, G., Sun, L., Wang, Yingchao, Wang, Yi, dan Wang, Yi, 2013. A new flavan-3-ol lactone and other constituents from *Euonymus alatus* with inhibitory activities on  $\alpha$ -glucosidase and differentiation of 3T3-L1 cells. *Natural Product Research*, **27**: 1513–1520.