

BAB 5

KESIMPULAN DAN SARAN

5.1 Kesimpulan

Berdasarkan hasil penelitian dapat disimpulkan beberapa hal yaitu:

1. Ekstrak herba sambiloto (*Andrographis panniculata*) dapat mempercepat proses penyembuhan luka tikus diabetes yang ditinjau dari pengecilan ukuran diameter luka.
2. Ekstrak herba sambiloto (*Andrographis panniculata*) memiliki aktivitas inhibisi pada enzim DPP-4 pada jaringan luka tikus diabetes.
3. Ada korelasi antara pengecilan ukuran diameter luka dengan aktivitas inhibisi enzim DPP-4 pada luka tikus diabetes yang menggunakan ekstrak herba sambiloto (*Andrographis panniculata*).

5.2 Saran

Perlu dilakukan penelitian lebih lanjut mengenai penggunaan sediaan topikal yang menggunakan bahan alam dengan konsentrasi tertentu sehubungan dengan mekanisme penghambatan enzim DPP-4.

DAFTAR PUSTAKA

- Akbar, S. 2011, *Andrographis paniculata* : A review of pharmacological activities and clinical effects. *Journal of Alternative Medicine Review*, **16(1)**: 66-77.
- Amstrong, F.B. 1995, *Buku Ajar Biokimia*, diterjemahkan dari Bahasa Inggris oleh R.F.Maulany, Penerbit Buku Kedokteran EGC, Jakarta.
- Badan Pengawas Obat dan Makanan RI. 2004, *Monografi Ekstrak Tumbuhan Obat Indonesia*, **1**, Jakarta:BPOM
- Bharti, S. K., Krishnan, S., Kumar, A., Rajak, K. K., Murari, K., Bharti, B. K., & Gupta, A. K. 2012, Antihyperglycemic activity with DPP-IV inhibition of alkaloids from seed extract of *Castanospermum austrole*: Investigation by experimental validation and molecular docking, *Phytomedicine*, **20(1)** : 24–31.
- Brem, H., & Tomic-Canic, M. 2007, Cellular and molecular basis of wound healing in diabetes. *Journal of Clinical Investigation*, **117(5)**: 1219–1222.
- Dalimarta, S. 2008, *Atlas Tumbuhan Obat* Jilid 5, PT Pustaka Bunda, Jakarta.
- Deacon, C. F. 2019, Physiology and Pharmacology of DPP-4 in Glucose Homeostasis and the Treatment of Type 2 Diabetes. *Frontiers Endocrinology*, University of Copenhagen, Copenhagen.
- Departemen Kesehatan RI, 1980, *Materia Medica Indonesia* Jilid 4, Jakarta: Departemen Kesehatan Republik Indonesia.
- Departemen Kesehatan RI. 2000, *Parameter Standar Umum Ekstrak Tumbuhan Obat*, Jakarta: Departemen Kesehatan Republik Indonesia.
- Departemen Kesehatan RI. 2000, *Parameter Standart Umum Ekstrak Tumbuhan Obat*, Jakarta: Departemen Kesehatan Republik Indonesia.
- Farnsworth, N. R. 1966, Biological and Phytochemical Screening of Plants. *Journal of Pharmaceutical Sciences*, **55(3)**: 225–276.

- Federer, W. T. 1966, Randomization and Sample Size in Experimentation. *Lecture Presented at The Food and Drug Administration Statistic Seminar*. Cornell University, Washington, D.C. hal. 2-5.
- Gaba, A., Ghosh, P.K., 2013, Phyto-Extracts in Wound Healing, *Journal Pharmaceutical Scientist*, **16(5)**:760 – 820.
- Harborne, J., B. 1987, Metode Fitokimia. Terjemahan: Padmawinata, K dan Soediro, I. Institut Teknologi Bandung, Bandung.
- He, H., Tran, P., Yin, H., Smith, H., Batard, Y., Wang, L., Howard, D. 2008, Absorption, Metabolism, and Excretion of [14C] Vildagliptin, a Novel Dipeptidyl Peptidase 4 Inhibitor, in Humans. *Drug Metabolism and Disposition*, **37(3)**: 536–544.
- Herman, G. A., Bergman, A., Liu, F. Stevens, C. Wang, A.Q., Zeng, W. Chen, L., Snyder, K., Hilliard, D. Tanen, M. Tanaka, W., Meehan, A.G., Lasseter, K., Dilzer, S., Blum, R. Wagner, J.A.. 2005, Pharmacokinetics and pharmacodynamics of sitagliptin, an inhibitor of DPP-4, in healthy subjects; results from two randomized double-blind, placebo controlled studies with single oral dose. *Clinical Pharmacology Therapeutics* **78**: 675–688.
- Janvier Labs. 2013, *Research Model*: Sprague Dawley Rat [Online]. Diakses: 23 Desember 2019. Tersedia di: <http://www.janvier-labs.com/rodent-research-modelsservices/researchmodels/per-species/outbred-rats/product/sprague-dawley.html>
- Katsumata, K., and Katsumata, Y. 1992, Protective Effect of Diltiazem Hydrochloride on the Occurrence of Alloxan- or Streptozotocin-Induced Diabetes in Rats. *Hormone and Metabolic Research*, **24(11)**: 508–510.
- Kharroubi, A., Darwish, Hisham M. 2015, Diabetes mellitus: The epidemic of the century, *World Journal of Diabetes*. **6(6)** : 850-867.
- Kleppinger, E. L., & Helms, K. 2007, The Role of Vildagliptin in the Management of Type 2 Diabetes Mellitus. *Annals of Pharmacotherapy*, **41(5)**: 824-832.
- Konsue, A. Picheansoonthon C, Talubmook C. 2017, Fasting Blood Glucose Levels and Hematological Values in Normal and Streptozotocin-Induced Diabetic Rats of *Mimosa pudica* L. Extracts. *Pharmacognosy Journal*, **9(3)**: 315-22.

- Koteswara. R.Y., Vimalamma, G., Venkata R. C., & Tzeng, Y.M. 2004, Flavonoids and andrographolides from *Andrographis paniculata*, *Phytochemistry*, **65(16)**: 2317–2321.
- Kumoro, A.C., Hasan, M., 2007, Supercritical Carbon Dioxide Extraction of Andrographolide from *Andrographis paniculata*: Effect of the Solvent Flow Rate, Pressure, and Temperature , *China Journal of Chemical Engineering*, **15**:877-883.
- Lenzen, S. 2007, The mechanisms of alloxan- and streptozotocin-induced diabetes. *Diabetologia*, **51(2)**: 216–226.
- Lim, N. S. J., Sham, A., Chee, S. M. L., Chan, C., & Raghunath, M. 2016, Combination of ciclopirox olamine and sphingosine-1-phosphate as granulation enhancer in diabetic wounds, *Wound Repair and Regeneration*, **24(5)**:795–809.
- Long, M., Cai, L., Zhang, L., Guo, S., Li, W., Zhang, R., Zheng, Y., Wang, M., Zhou, X., Zheng, H., Yang, G., Zhu, Z., Li, L. 2017, DPP-4 Inhibitors Improve Diabetic Wound Healing via Direct and Indirect Promotion of Epithelial-Mesenchymal Transition and Reduction of Scarring, *Translational Research Key Laboratory for Diabetes*, Xinqiao Hospital, Third Military Medical University, Chongqing 400037, China.
- Monica, G. Sarbjot, S., Punam, G., 2009, Dipeptidyl Peptidase-4 Inhibitors: A New Approach in Diabetes Treatment. *International Journal.Drug Development & Researcch*, **1(1)**: 146-156
- Mulvihill, E. E., & Drucker, D. J. 2014, Pharmacology, Physiology, and Mechanisms of Action of Dipeptidyl Peptidase-4 Inhibitors. *Endocrine Reviews*, **35(6)**: 992–1019.
- Nandari, R. 2006. ‘Pengaruh Pemberian Ekstrak Belimbing Wuluh Terhadap Kadar Testosteron Bebas Non Libido Tikus Jantan Galur Wistar’. *Thesis*. Universitas Diponegoro, Semarang.
- Nazarko, L. 2009. Wound Healing and Moisture Balance: Selecting Dressing. *Nursing & Residentia*. **11(6)** :286-291.
- Notoatmodjo. 2012, *Metodologi Penelitian Kesehatan*, Rineka Cipta, Jakarta.
- Rahayu, N.L.P. 2014, ‘Aktivitas inhibisi dipeptidyl peptidase IV dari kombinasi ekstrak Etanol *Syzygium polyanthum* dan Ekstrak

- Etanol *Andrographis paniculata*', Skripsi, Universitas Katolik Widya Mandala, Surabaya.
- Röhrborn, D., Wronkowitz, N. and Eckel, J., 2015, DPP4 in diabetes, *Frontiers in Immunol.* **6**: 386.
- Salazar, J. J., Ennis, W. J., & Koh, T. J. 2016, Diabetes medications: Impact on inflammation and wound healing. *Journal of Diabetes and Its Complications*, **30(4)** : 746–752.
- Schürmann, C. Linke, A. Engelmann-Pilger, K. Steinmetz, C. Mark, M. Pfeilschifter, J. Klein, T. and Frank, S. 2012, The dipeptidyl peptidase-4 inhibitor linagliptin attenuates inflammation and accelerates epithelialization in wounds of diabetic ob/ob mice. *Journal of Pharmacol Experimental Therapeutics*, **342(1)**: 71-80.
- Sharp, A. J, Clark. 2011, Diabetes and its effects on wound healing, *Nursing Standard*, **25(45)**: 41-47.
- Sharp, P. E. Dan Villano, J. 2013, *The Laboratory Rat*. Ed 2nd, CRC Press, California. Hal 9-11.
- Sigma-Aldrich. 2019, 96 well plate diakses pada 25 november 2019,<https://www.sigmaaldrich.com/technical-documents/articles/biology/96-well-plate-template.html>,2019.
- Sugiyono. 2013, *Metode Penelitian Pendidikan Pendekatan Kuantitatif, kualitatif, dan R & D*. Alfabeta. Bandung.
- Suharmiati. 2003, Pengujian Bioaktivitas Anti Dibetes Melitus Tumbuhan Obat. *Badan Penelitian Pengembangan Kesehatan*, Pusat Penelitian dan Pengembangan Pelayanan dan Teknologi Kesehatan, Surabaya: Departemen Kesehatan Republik Indonesia.
- Sukarti, E., Hartanti, L. dan Setiawan, H. K. 2013, 'Pengujian Potensi kombinasi ekstrak air sambiloto (*Andrographis paniculata*) dan ekstrak air daun salam (*Syzygium polianthum*) sebagai inhibitor dipeptidyl peptidase IV dan α -Glukosidase pada Penatalaksanaan terapi diabetes mellitus tipe 2', *Laporan Penelitian Unggulan Perguruan Tinggi*, Universitas Katolik Widya Mandala, Surabaya. hal 39-42.
- Terisno, R.A, 2013, 'Uji Daya Inhibisi Dari Ekstrak Air Herba *Andrographis paniculata* Terhadap Enzim Dipeptidyl Peptidase IV', Skripsi, Sarjana Farmasi, Universitas Katolik Widya Mandala, Surabaya.

- Trivedi, N.P., & Rawal, U. M. 2001, Hepatoprotective and antioxidant property of *Andrographis paniculata* Nees in BHC induced liver damage in mice. *Indian Journal of Experimental Biology*, **39(1)**: 41–46.
- Villhauer, E. B., Brinkman, J. A., Naderi, G. B., Burkey, B. F., Dunning, B. E., Prasad, K., Hughes, T. E. 2003, 1-[(3-Hydroxy-1-adamantyl)amino]acetyl]-2-cyano-(S)-pyrrolidine: A Potent, Selective, and Orally Bioavailable Dipeptidyl Peptidase IV Inhibitor with Antihyperglycemic Properties. *Journal of Medicinal Chemistry*, **46(13)** : 2774–2789.
- Yatoo, M. I., Saxena. A., Gopalakrishnan, A., Alagawany. M., and Dhama, K. 2017, Review Article Promising Antidiabetic Drugs, Medicinal Plants and Herbs: An Update. *International Journal of Pharmacology*, **13(7)**: 732-745.
- Yu, D. M., Yao, T.W., Chowdhury. S, Nadvi N. A, Osborne, B., Church, W.B., McCaughan, G.W., Gorrell, M.D. 2010, The dipeptidyl peptidase IV family in cancer and cell biology. *The Federation Of European Biochemical Societies Journal* **277(5)**: 1126-1144.
- Yulinah, E. Sukarso dan Fitri, M. 2001, Aktivitas Antidiabetika Ekstrak Etanol Herba Sambiloto (*Andrographis paniculata* Ness (Acanthaceae), *Jurnal Matematika dan Sains*. **6(1)**: 1- 5.
- Zheng, Y., Ley, S. H., & Hu, F. B. 2017, Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nature Reviews Endocrinology*, **14(2)**: 88–98.