

BAB 5

KESIMPULAN DAN SARAN

5.1 Kesimpulan

1. Metode pengujian potensi antiglikasi berdasarkan fluoresensi AGEs diukur dengan spektrofluorometer dan metode pengujian ELISA, dengan parameter potensi aktivitas antiglikasi nilai IC₅₀ yang merepresentasikan konsentrasi efektif bahan atau senyawa uji untuk menghambat pembentukan 50% jumlah AGEs.
2. Kandungan senyawa kulit buah delima (*Punica granatum* L) yang memiliki aktivitas antiglikasi pada diabetes mellitus yaitu punikalin (tanin), punikalagin (polifenol), dan asam eilagak (polifenol), yang berpotensi menghambat pembentukan AGEs dengan mengikat gugus amino pada protein, serta mencegah interaksi awal dengan glukosa.

5.2 Saran

1. Bagi masyarakat: penelitian kajian pustaka ini diharapkan dapat menjadi sumber referensi bagi kalangan masyarakat agar dapat memanfaatkan kulit buah delima sebagai pengobatan pada diabetes mellitus.
2. Bagi peneliti: diharapkan dapat mengembangkan penelitian lebih lanjut terkait kulit buah delima (*Punica granatum* L) yang membahas mengenai kandungan senyawa dan efek farmakologi lain yang terdapat dalam ekstrak kulit buah delima.

DAFTAR PUSTAKA

- Adeshara, K. A., Agrawal, S. B., Gaikwad, S. M., & Tupe, R. S. 2018, Pioglitazone Inhibits Advanced Glycation Induced Protein Modifications and Down-regulates Expression of RAGE and NF- κ B in Renal Cells. *International Journal of Biological Macromolecules*, **119**, 1154–1163. <https://doi.org/10.1016/j.ijbiomac.2018.08.026>
- Adeshara, K. A., Bangar, N. S., Doshi, P. R., Diwan, A., & Tupe, R. S. 2020, Action of Metformin Therapy Against Advanced Glycation, Oxidative Stress and Inflammation in Type 2 Diabetes Patients: 3 Months Follow-up Study. *Diabetes & Metabolic Syndrome*, **14(5)**, 1449–1458. <https://doi.org/10.1016/j.dsx.2020.07.036>
- American Diabetes Association. 2021. Classification and Diagnosis of Diabetes: *Standards of Medical Care in Diabetes-2021*. *Diabetes Care*, **44(Suppl 1)**, S15–S33. <https://doi.org/10.2337/dc21-S002>
- Amri, Z., Amor, I. B., Zarrouk, A., Chaaba, R., Gargouri, J., Hammami, M., & Hammami, S. 2022, Anti-glycation, Antiplatelet and Antioxidant Effects of Different Pomegranate Parts. *BMC Complementary Medicine and Therapies*, **22(1)**, 339. <https://doi.org/10.1186/s12906-022-03824-6>
- Asgharpour Dil, F., Ranjkesh, Z., & Goodarzi, M. T. 2019, A Systematic Review of Antiglycation Medicinal Plants. *Diabetes & Metabolic Syndrome*, **13(2)**, 1225–1229. <https://doi.org/10.1016/j.dsx.2019.01.053>
- Bhowmik, D., Vel, B., Gopinath, H., Kumar, B.P., Aravind, & Kumar, K.P. 2013, Medicinal Uses Of Punica Granatum And Its Health Benefits. *Journal of Pharmacognosy and Phytochemistry*, **1**, **28-35**.
- Chukwuma, C. I., Mashele, S. S., & Akuru, E. A. 2020, Evaluation of The In Vitro α -amylase Inhibitory, Antiglycation, and Antioxidant Properties of *Punica granatum* L. (pomegranate) Fruit Peel Acetone Extract and Its Effect on Glucose Uptake and Oxidative Stress in Hepatocytes. *Journal of Food Biochemistry*, **44(5)**, e13175. <https://doi.org/10.1111/jfbc.13175>

- Di Sotto, A., Locatelli, M., Maccone, A., Toniolo, C., Cesa, S., Carradori, S., Eufemi, M., Mazzanti, G., & Di Giacomo, S. 2019, Hypoglycemic, Antiglycation, and Cytoprotective Properties of a Phenol-Rich Extract From Waste Peel of *Punica granatum* L. var. Dente di Cavallo DC2. *Molecules (Basel, Switzerland)*, **24(17)**, 3103. <https://doi.org/10.3390/molecules24173103>
- Dipiro, J., Talbert, L.R., Yee, G.C., Matzke, G R., Wells, B.G., Possey, L.M. 2015, *Pharmacotherapy A Pathophysiologic Approach*, 9 th Edition, Micc Grow Hill Medical, Washington Dc, 1026-1226.
- Direktorat Jenderal Kefarmasian dan Alat Kesehatan (Dit Farmalkes). 2017. *Farmakope Herbal Indonesia*. ed.2. Kementerian Kesehatan Republik Indonesia
- Fitrah, M & Luthfiyah. 2017, *Metode Penelitian; Penelitian Kualitatif, Tindakan Kelas & Studi Kasus*. CV Jejak. Sukabumi.
- Gora, R. 2019. *Riset Kualitatif Public Relations*. Surabaya. Jakad Publishing.
- Gupta, A., Sharma, M.B., & Sharma, J. 2015, A Role of Insulin in Different Types of Diabetes. *International Journal of Current Microbiology and Applied Sciences*. ISSN: 2319-7706 Volume 4 Number 1 (2015) pp. **58-77**. India
- Gull, H., Ikram, A., Khalil, A. A., Ahmed, Z., & Nemat, A. 2023, Assessing The Multitargeted Antidiabetic Potential of Three Pomegranate Peel-specific Metabolites: An In Silico and Pharmacokinetics Study. *Food Science & Nutrition*, **11(11)**, 7188–7205. <https://doi.org/10.1002/fsn3.3644>
- Habtemariam, S. 2019, Chapter 12 - The Chemical and Pharmacological Basis of Pomegranate (*Punica grantum* L) as Potential Therapy for Type-2 Diabetes and Metabolic Syndrome. *Medicinal Foods as Potential Therapies for Type-2 Diabetes and Associated Diseases*, Pages **365-433**, ISBN 9780081029220. <https://doi.org/10.1016/B978-0-08-102922-0.00012-2>.
- IDF. 2019. *Nine edition 2019. International Diabetes Federation. IDF Diabetes Atlas, 9th edn*. Brussels, Belgium : International Diabetes Federation, 2019. <http://www.diabetesatlas.org> ISBN: 978-2-930229-87-4
- Jeevanandam J, Madhumitha R, Saraswathi N. 2021, Identification of Potential Phytochemical Lead Against Diabetic Cataract: An

Insilico Approach, Journal of Molecular Structure, Volume **1226**, Part B, 129428, ISSN 0022-2860, <https://doi.org/10.1016/j.molstruc.2020.129428>

- Khan, M., Liu, H., Wang, J., & Sun, B. 2020, Inhibitory Effect of Phenolic Compounds and Plant Extracts on The Formation of Advance Glycation End Products: A Comprehensive Review. *Food Research International (Ottawa, Ont.)*, **130**, 108933. <https://doi.org/10.1016/j.foodres.2019.108933>
- Liu, W., Ma, H., Frost, L., Yuan, T., Dain, J. A., & Seeram, N. P. 2014, Pomegranate Phenolics Inhibit Formation of Advanced Glycation Endproducts by Scavenging Reactive Carbonyl Species. *Food & Function*, **5(11)**, 2996–3004. <https://doi.org/10.1039/c4fo00538d>
- Liu, W., Ma, H., DaSilva, N. A., Rose, K. N., Johnson, S. L., Zhang, L., Wan, C., Dain, J. A., & Seeram, N. P. 2016, Development of A Neuroprotective Potential Algorithm for Medicinal Plants. *Neurochemistry International*, **100**, 164–177. <https://doi.org/10.1016/j.neuint.2016.09.014>
- Maphetu N, Unuofin J, Masuku N, Olisah C, Lebelo S. 2022, Medicinal Uses, Pharmacological Activities, Phytochemistry, and The Molecular Mechanisms of *Punica granatum* L. (Pomegranate) Plant Extracts: A Review, *Biomedicine & Pharmacotherapy*, Volume **153**, 113256, ISSN 0753-3322, <https://doi.org/10.1016/j.biopha.2022.113256>
- Mestry, S. N., Dhodi, J. B., Kumbhar, S. B., & Juvekar, A. R. 2016, Attenuation of Diabetic Nephropathy in Streptozotocin-Induced Diabetic Rats by *Punica granatum* Linn. Leaves Extract. *Journal of Traditional and Complementary Medicine*, **7(3)**, 273–280. <https://doi.org/10.1016/j.jtcme.2016.06.008>
- Mulyati, S. 2016, Peranan *Advanced Glycation End-products* Pada Diabetes, Spesialis Gizi Klinik, Siloam Hospital, Makassar, Indonesia.
- Nur, M. S. dan Uyun, A. S. 2020, Tinjauan Pustaka Sistematis: Pengantar Metode Penelitian Sekunder Untuk Energi Terbarukan Bioenergi, Lakeisha, Jawa Tengah.
- Pae, C. U., 2015, Why Systematic Review Rather Than Narrative Review, *Psychiatry Investigation*, **12(3)**: 417 – 419.

- Perkeni. 2021. *Konsensus Pengelolaan dan Pencegahan Diabetes Mellitus Tipe 2 di Indonesia*. PB Perkeni, Jakarta.
- Quiles, J., Cabrera, M., Jones, J., Tsapekos, M., & Caturla, N. 2022, In Vitro Determination of The Skin Anti-Aging Potential of Four-Component Plant-Based Ingredient. *Molecules (Basel, Switzerland)*, **27(22)**, 8101 <https://doi.org/10.3390/molecules27228101>
- Ramlagan, P., Rondeau, P., Neergheen, V. S., Bourdon, E., & Bahorun, T. 2021, The Prophylactic Activity of *Punica granatum* L Mesocarp Protects Preadipocytes Against Ribosylated BSA-Induced Toxicity. *Journal of The American College of Nutrition*, **40(6)**, 502–516. <https://doi.org/10.1080/07315724.2020.1793701>
- Rezaei A, Farzadfard A, Amirahmadi A, Alemi M, Khademi M. 2015, Diabetes Mellitus and Its Management With Medicinal Plants: A Perspective Based on Iranian Research, *Journal of Ethnopharmacology*, Volume **175**, Pages **567-616**, ISSN 0378-8741, <https://doi.org/10.1016/j.jep.2015.08.010>
- Roudbari, M., Barzegar, M., & Sahari, M. A. 2024, Pistachio Green Hull and Pomegranate Peel Extracts as Two Natural Antiglycation Agents *Food Science & Nutrition*, **12(5)**, 3688–3695. <https://doi.org/10.1002/fsn3.4039>
- Sharifi-Rad, J., Quispe, C., Castillo, C. M. S., Caroca, R., Lazo-Vélez, M. A., Antonyak, H., Polishchuk, A., Lysiuk, R., Oliinyk, P., De Masi, L., Bontempo, P., Martorell, M., Daştan, S. D., Rigano, D., Wink, M., & Cho, W. C. 2022, Ellagic Acid: A Review on Its Natural Sources, Chemical Stability, and Therapeutic Potential. *Oxidative Medicine and Cellular Longevity*, 2022, 3848084. <https://doi.org/10.1155/2022/3848084> (Retraction published *Oxid Med Cell Longev.* 2024 Jan 9; 2024:9801541. doi: 10.1155/2024/9801541)
- Sanulita, H., Putra, P., Laka, L., Amalia, M., Anggraeni, A., Ardiansyah, W., Azizah, N., Putra, S., Suprayitno, D., Sumiati, S., Judianto, L. 2024, *Panduan Praktis Penulisan Karya Tulis Ilmiah*. PT. Green Pustaka Indonesia. Yogyakarta
- Simbolon, D. 2021, *Literature Review Untuk Penelitian Kesehatan*, Bintang Pustaka Madani, Yogyakarta

- Singh, V. P., Bali, A., Singh, N., & Jaggi, A. S. 2014, Advanced Glycation Endproducts and Diabetic Complications. *The Korean Journal of Physiology & Pharmacology : Official Journal of The Korean Physiological Society and The Korean Society of Pharmacology*, **18(1)**, 1–14.
<https://doi.org/10.4196/kjpp.2014.18.1.1>
- Vučić, V., Grabež, M., Trchounian, A., & Arsić, A. 2019, Composition and Potential Health Benefits of Pomegranate: A Review. *Current Pharmaceutical Design*, **25(16)**, 1817–1827.
<https://doi.org/10.2174/1381612825666190708183941>
- Western, U. of. 2020, Literature Review's, Introduction to Differents Types of. Reterieved from <https://www.lib.uwo.ca/tutorials/typesofliteraturereviews/index.html>
- Winarno, F.G. 2023, *Delima dan Potensinya Bagi Kesehatan*, Penerbit Gramedia Pustaka Utama, Anggota IKAPI, Jakarta.
- World Heald Organization. 2019. *Clasification of Diabetes Mellitus*. ISBN 978-92-4 151570-2.
- Meng X, Li Q, Shi R, Chang J, Chang H, Li M. 2021, Food Supplements Could Be An Effective Improvement of Diabetes Mellitus: A Review, *Journal of Future Foods*, Volume Issue **1**, Pages **67-81**, ISSN 2772-5669, <https://doi.org/10.1016/j.jfutfo.2021.09.003>