

BAB 7 **SIMPULAN DAN SARAN**

7.1 Simpulan

Hal yang dapat disimpulkan berdasarkan penelitian adalah ekstrak buah jujube merah kering memiliki efek hepatoprotektif terhadap kadar ALT dan AST tikus wistar hepatotoksik terinduksi *acetaminophen*.

7.2 Saran

Saran untuk penelitian selanjutnya:

- a. Melakukan optimalisasi pada proses ekstraksi buah jujube merah kering.
- b. Melakukan uji efek hepatoprotektif ekstrak buah jujube merah kering dalam jangka waktu yang sama dengan penelitian ini, namun dengan dosis yang lebih tinggi untuk mengetahui dosis ekstrak yang lebih efektif.
- c. Melakukan uji efek hepatoprotektif ekstrak buah jujube merah kering dalam jangka waktu lebih pendek untuk melihat efek pemberian jangka pendek.
- d. Melakukan uji hepatotoksitas ekstrak buah jujube merah kering.
- e. Melakukan penelitian efek hepatoprotektif ekstrak buah jujube merah kering dengan manusia sebagai sampel penelitian.
- f. Melakukan penelitian untuk eksplorasi efek atau manfaat ekstrak buah jujube merah kering yang lain selain efek hepatoprotektif.

DAFTAR PUSTAKA

1. Barrett K. E., Barman S. M., & Brooks H. L., et al. *Ganong's Review of Medical Physiology*, 26e. McGraw Hill. 2019;4(28).
2. Asrani S. K., Devarbhavi H., & Eaton J., et al. *Burden of Liver Diseases in The World*. J Hepatol. 2019;70(1):151-171 [disitasi 5 Maret 2022]. DOI: 10.1016/j.jhep.2018.09.014.
3. World Health Rankings. *Liver Disease in Indonesia*. 2020 [disitasi 5 Maret 2022]. Diunduh dari: <https://www.worldlifeexpectancy.com/indonesia-liver-disease>.
4. James W. D., & D. Nicholas Bateman. *Paracetamol Poisoning*. Medicine. 2020;48(3):208-210 [disitasi 1 Desember 2021]. DOI: 10.1016/j.mpmed.2019.12.017.
5. Rubin, J. B., Hameed, B., & Gottfried, M., et al. *Acetaminophen-induced Acute Liver Failure Is More Common and More Severe in Women*. Clinical Gastroenterology and Hepatology. 2018;16(6):936–946 [disitasi 29 Mei 2022]. DOI: 10.1016/j.cgh.2017.11.042.
6. Jameson, J. L., Kasper, D. L., & Longo, D. L., et al. *Harrison's Principles of Internal Medicine*, 20e. 2018:2339.
7. Wang, B. N., Huang, & Qingyuan, et al. *Changes in Phenolic Compounds and Their Antioxidant Capacities in Jujube (Ziziphus jujuba Miller) during Three Edible Maturity Stages*. LWT - Food Science and Technology. 2016;66:56-62. [disitasi 24 Februari 2022]. DOI: 10.1016/j.lwt.2015.10.005.
8. Wang, C., Cao, J., & Jiang, W., et al. *Effect of The Drying Method on Browning of Flesh, Antioxidant Compounds and Antioxidant Capacity of Chinese jujube (Zizyphus jujuba Mill.) Fruit*. Current Topics in Nutraceutical Research. 2016;14:161-9. [disitasi 5 Maret 2022].
9. Huang, W., & Wang, et al. *Protective Effect of Flavonoids from Ziziphus jujuba cv. Jinsixiaozao against Acetaminophen-Induced Liver Injury by Inhibiting Oxidative Stress and Inflammation in Mice*. Molecules. 2017 [disitasi 6 Maret 2022]. DOI: 10.3390/molecules22101781.
10. Ahmed K. R., Naymul K., & Mohammad R. I. S., et al. *Jujube Fruit: A Potential Nutritious Fruit for The Development of Functional Food Products*. Journal of Functional Foods. 2020;75. [disitasi 10 Februari 2022]. DOI: 10.1016/j.jff.2020.104205.
11. Hashem, Dabaghian F., Hassani A., & Nayeri N., et al. *Anti-Proliferative and Apoptotic Effects of Aqueous Extract of Ziziphus Jujube in Human Thyroid Carcinoma Cell Lines (C643)*. Int J Cancer Manag. 2018;11(7):e65820. [disitasi 24 Maret 2022]. DOI: 10.5812/ijcm.65820.

12. Kim, Y., Oh, J., & Jang, C. H., et al. *In Vivo Anti-inflammatory Potential of Viscozyme®-Treated Jujube Fruit*. Switzerland: Foods. 2020;9(8):1033. [disitasi 24 Maret 2022]. DOI: 10.3390/foods9081033.
13. [ITIS] Integrated Taxonomic Information System. *Taxonomy Hierarchy: Ziziphus jujuba Mill.* 2011 [disitasi 12 Februari 2022]. Diunduh dari: Integrated Taxonomic Information System (ITIS) online database, www.itis.gov, CC0. DOI: 10.5066/F7KH0KBK.
14. Jang-Eun Lee, Jeong Hyun Yun, & Ae Ran Lee, et al. *Volatile Components and Sensory Properties of Jujube Wine as Affected by Material Preprocessing*. International Journal of Food Properties. 2018;21(1):2052-2061. [disitasi 23 Februari 2022]. DOI: 10.1080/10942912.2018.1514506.
15. Reche J, Almansa MS, & Hernández F, et al. *Physicochemical and Antioxidant Capacity of Jujube (Ziziphus jujuba Mill.) at Different Maturation Stages*. Agronomy. 2021;11(1):132. [disitasi 24 Februari 2022]. DOI: 10.3390/agronomy11010132.
16. Liu, M., Wang, J., & Wang, L., et al. *The Historical and Current Research Progress on Jujube—A Superfruit for The Future*. Hortic Res. 2020;7:119. [disitasi 12 Februari 2022]. DOI: 10.1038/s41438-020-00346-5.
17. Xue X, Zhao A, & Wang Y, et al. *Composition and Content of Phenolic Acids and Flavonoids Among the Different Varieties, Development Stages, and Tissues of Chinese Jujube (Ziziphus jujuba Mill.)*. PLoS One. 2021 [disitasi 15 Maret 2022]. DOI: 10.1371/journal.pone.0254058.
18. Mamari, H. H. A. *Phenolic Compounds: Classification, Chemistry, and Updated Techniques of Analysis and Synthesis*. in F. A. Badria (ed.), Phenolic Compounds - Chemistry, Synthesis, Diversity, Non-Conventional Industrial, Pharmaceutical and Therapeutic Applications, IntechOpen, London. 2021 [disitasi 15 Maret 2022]. DOI: 10.5772/intechopen.98958.
19. Patil, V. M., & Masand, N. *Anticancer Potential of Flavonoids: Chemistry, Biological Activities, and Future Perspectives*. Studies in Natural Products Chemistry. 2019:401–430. [disitasi 15 Maret 2022]. DOI: 10.1016/b978-0-444-64179-3.00012-8.
20. Allen, Loyd. *Quality Control: Water Activity Considerations for Beyond-use Dates*. International Journal of Pharmaceutical Compounding. 2018;22: 288-293. [disitasi 13 Maret 2022].
21. Guiné, Raquel. *The Drying of Foods and Its Effect on the Physical-Chemical, Sensorial and Nutritional Properties*. International Journal of Food Engineering. 2018 [disitasi 5 Maret 2022]. DOI: 10.18178/ijfe.4.2.93-100.

22. United States Department of Agriculture (USDA). *Jujube*. Food Data Central. U.S. Department of Agriculture. 2018 [disitasi 23 April 2022]. Diunduh dari: <https://fdc.nal.usda.gov/fdc-app.html#/?query=jujube>.
23. Tepe, Fadime & Ekinci, Raci. *Drying Characteristics and Some Quality Parameters of Whole Jujube (Zizyphus jujuba Mill.) during Hot Air Drying*. Italian Journal of Food Science. 2021;33. [disitasi 14 Maret 2022]. DOI: 10.15586/ijfs.v33i1.1947.
24. Li C., Ding Y., & Lv X., et al. *Effect of Drying Method on Total Flavonoids in Red Jujube*. Chemical Engineering Transactions. 2017;59:745-750. [disitasi 14 Maret 2022]. DOI: 10.3303/CET1759125.
25. Hu, Y. F., Cui, H. Y., & Jiang, X.Y., et al. *Harvest Maturity, Storage Temperature and Storage Time Affect Antioxidant and Antiproliferation Activities of Jujube Fruit*. 4th International Conference on Bioinformatics and Biomedical Engineering. 2010 [disitasi 14 Maret 2022]. DOI: 10.1109/icbbe.2010.5516335.
26. Song, S., Huang, & Xue, et al. *Drying Characteristics and Quality Analysis of Hot Air-Assisted Radio Frequency and Hot-Air Drying of Jujube (Zizyphus jujube Miller cv. Jinsixiaozao)*. Engenharia Agrícola. 2022;42. [disitasi 14 Maret 2022]. DOI: 10.1590/1809-4430-eng.agric.v42n1e20210112/2022.
27. Safizadeh, B., Hoshyar, R., & Hemmati, M., et al. *A Preliminary Evaluation of Effects of High Doses of Jujube and Saffron on Biochemical and Hematological Parameters in Rats*. Clinical Phytoscience. 2016;2(1). [disitasi 22 April 2022]. DOI:10.1186/s40816-016-0029-0.
28. Drake, R. L., Vogl, W., & Mitchell, A. W. M., et al. *Gray's Anatomy for Students*, 4e. Philadelphia: Elsevier. 2020:328-330,347,354.
29. Mescher A. L., & Junqueira, L.C.U. *Junqueira's Basic Histology Text and Atlas*, 14e. New York: McGraw Hill Education. 2018;16:338-9.
30. Ferrier, Denise R. *Lippincott Illustrated Reviews: Biochemistry*, 7e. Philadelphia, PA: Wolters Kluwer Health. 2017:250.
31. Dr. Anil Batta. *Comparative Study of Transaminase Ratio, AST, ALT and GGT in Cases of Chronic Hepatitis*. International Journal of Medical and Health Research. 2019;5(1):31-5. [disitasi 17 Maret 2022].
32. Katzung B.G.(Ed.). *Basic & Clinical Pharmacology*, 14e. McGraw Hill; 2018:64-5.
33. Badan Pengawas Obat dan Makanan. *Parasetamol (Asetaminofen)*. 2015 [disitasi 2 Desember 2021]. Diunduh dari: <http://pionas.pom.go.id/monografi/parasetamol-asetaminofen>.

34. Farrell, S.E., Defendi G. L., Miller M. A., et al. *Acetaminophen Toxicity*. Medscape. 2021 [disitasi 9 April 2022]. Diunduh dari: <https://emedicine.medscape.com/article/820200-overview>.
35. Brunton L. L. & Hilal-Dandan R. *Goodman & Gilman's: The Pharmacological Basis of Therapeutics*, 13e. McGraw Hill. 2017:693-6.
36. Rodwell, V. W., Bender, D. A., & Botham, K. M., et al. *Harper's Illustrated Biochemistry*, 31e. 2018;45:1325.
37. Su, L. J., Zhang, & Jia-Hao, et al. *Reactive Oxygen Species-Induced Lipid Peroxidation in Apoptosis, Autophagy, and Ferroptosis. Oxidative Medicine and Cellular Longevity*. 2019 [disitasi 16 Maret 2022]. DOI: 10.1155/2019/5080843.
38. Myers, P., R. Espinosa, & C. S. Parr, et al. *The Animal Diversity Web* (online). 2022 [disitasi 17 Februari 2022]. Diunduh dari: <https://animaldiversity.org>.
39. Delgado-Montemayor, C., Cordero-Pérez, P., & Salazar-Aranda, R., et al. *Models of Hepatoprotective Activity Assessment*. Medicina Universitaria. 2016;17. [disitasi 16 Maret 2022]. DOI: 10.1016/j.rmu.2015.10.002.
40. Boadi, W.Y., Stevenson, C., & Johnson, D., et al. *Flavonoids Reduce Lipid Peroxides and Increase Glutathione Levels in Pooled Human Liver Microsomes (HLMs)*. Advances in Biological Chemistry. 2021;11:283-295. [disitasi 16 Maret 2022]. DOI: 10.4236/abc.2021.116019.
41. Alvi, Mohsin. *A Manual for Selecting Sampling Techniques in Research*. University of Karachi, Iqra University. 2016:16-7. [disitasi 28 Mei 2022]. Diunduh dari: <https://mpra.ub.uni-muenchen.de/70218/>.
42. Zakaria, Z. A., Kamisan, F. H., Kek, T. L., et al. *Hepatoprotective and Antioxidant Activities of Dicranopteris linearis Leaf Extract Against Paracetamol-induced Liver Intoxication in Rats*. Pharmaceutical Biology. 2020;58(1):478–489. [disitasi 23 Mei 2022]. DOI: 10.1080/13880209.2020.1764058.
43. Rogers, K. L. *Guidelines for Anesthesia and Analgesia in Rats*. Laboratory Animal Resources Guidelines: Indiana University Bloomington. 2022:4.
44. Yurista, S., Ferdian, R., & Sargowo, D. *Principles of the 3Rs and ARRIVE Guidelines in Animal Research*. Indonesian Journal of Cardiology. 2017;37(3):156-63. [disitasi 13 April 2022]. DOI: 10.30701/ijc.v37i3.579.
45. Badan Penelitian dan Pengembangan Pertanian. *Penggunaan dan Penanganan Hewan Coba Rodensia dalam Penelitian Sesuai Kesejahteraan Hewan*. Indonesian Agency for Agricultural Research and Development. 2019. [disitasi 29 Mei 2022].

46. Abubakar A. R., Haque M. *Preparation of Medicinal Plants: Basic Extraction and Fractionation Procedures for Experimental Purposes*. J Pharm Bioallied Sci. 2020;12(1):1-10. [disitasi 11 September 2022]. DOI: 10.4103/jpbs.JPBS_175_19.
47. Zhang Q. W., Lin L. G., Ye W. C. *Techniques for Extraction and Isolation of Natural products: A Comprehensive Review*. Chin Med. 2018;17(3):20. [disitasi 11 September 2022]. DOI: 10.1186/s13020-018-0177-x.
48. Feni, Iranawati & Narulitai, Rizqi & Dewi, et al. *Web Evaluation of Maceration Length Period on Antioxidant Potency of Sonneratia caseolaris Leaf*. E3S Web of Conferences. 2020:153. [disitasi 11 September 2022]. DOI: 10.1051/e3sconf/202015301010.
49. Kurniawati, I., Maftuch, M., & Hariati, A. M. *Determination of The Best Solvent and Extract Duration on The Technique of Gracilaria sp. Maceration as Well as Its Influence on Moisture Content and Yield*. Samakia: Jurnal Ilmu Perikanan. 2016;7(2):72-77. [disitasi 11 September 2022]. DOI: 10.5281/jsapi.v7i2.306.
50. Hasanein P., Sharifi M. *Effects of Rosmarinic Acid on Acetaminophen-induced Hepatotoxicity in Male Wistar Rats*. Pharm Biol. 2017;55(1):1809-1816. [disitasi 11 September 2022]. DOI: 10.1080/13880209.2017.1331248.
51. A.L. Fotio, M.S.D. Nguepi, L.B. Tonfack, et al. *Acetaminophen Induces Liver Injury and Depletes Glutathione in Mice Brain: Prevention by Moringa oleifera Extract*. South African Journal of Botany. 2020;129:317-323. [disitasi 11 September 2022]. DOI: 10.1016/j.sajb.2019.08.037.
52. Hong S., Kim Y., Sung J., et al. *Jujube (Ziziphus jujuba Mill.) Protects Hepatocytes against Alcohol-Induced Damage through Nrf2 Activation*. Evid Based Complement Alternat Med. 2020 [disitasi 11 September 2022]. DOI: 10.1155/2020/6684331.
53. Shen, X., & Tang, et al. *The Protective Effect of Zizyphus jujube Fruit on Carbon Tetrachloride-induced Hepatic Injury in Mice by Anti-Oxidative Activities*. Journal of Ethnopharmacology. 2009;122:555-560. [disitasi 11 September 2022]. DOI: 10.1016/j.jep.2009.01.027.
54. Dufour, D & Lott, John & Nolte, Frederick & Gretch, et al. *Diagnosis and Monitoring of Hepatic Injury. I. Performance Characteristics of Laboratory Tests*. Clinical chemistry. 2001;46:2027-49. [disitasi 11 September 2022]. DOI: 10.1093/clinchem/46.12.2027.