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DAFTAR PUSTAKA

Abdulai, I. L., Kwofie, S. K., Gbewonyo, W. S., Boison, D., Puplampu, J. B., & Adinortey, M. B. (2021). Multitargeted Effects of Vitexin and Isovitexin on Diabetes Mellitus and Its Complications. *The Scientific World Journal*, *2021*, 20.

Ahmad, I., Prabowo, W. C., Arifuddin, M., Fadraersada, J., Indriyanti, N., Herman, H., Purwoko, R. Y., Nainu, F., Rahmadi, A., Paramita, S., Kuncoro, H., Mita, N., Narsa, A. C., Prasetya, F., Ibrahim, A., Rijai, L., Alam, G., Mun'im, A., & Dej-Adisai, S. (2022). *Mitragyna Species* as Pharmacological Agents: From Abuse to Promising Pharmaceutical Products. *Life*, *12*(2), 1–22. https://doi.org/10.3390/life12020193

Akinboye, A. J., Kim, K., Choi, S., Yang, I., & Lee, J. G. (2023). Alkaloids in food: a review of toxicity, analytical methods, occurrence and risk assessments. *Food Science and Biotechnology*, *32*(9), 1133–1158. https://doi.org/10.1007/s10068-023-01295-0

American Diabetes Association. (2024). 2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2024. *Diabetes Care*, *47*(Supplement_1), S20–S42. https://doi.org/10.2337/dc24-S002

An, Y., Xu, B., Wan, S., Ma, X., Long, Y., Xu, Y., & Jiang, Z. (2023). The role of oxidative stress in diabetes mellitus-induced vascular endothelial dysfunction. *Cardiovascular Diabetology*, *22*(1), 237. https://doi.org/10.1186/s12933-023-01965-7

Andasari, S. D., Mustofa, C. H., & Arabela, E. O. (2021). Standarisasi Parameter Spesifik Dan Non Spesifik Ekstrak Etil Asetat Daun Beluntas (Pluchea indica L .). *CERATA Jurnal Ilmu Farmasi*, *1*, 47–53.

Apriliani, E. (2022). *Identifikasi Parameter Spesifik Dan Non Spesifik Pada Simplisia Dan Esktrak Daun Sungkai (Peronema Canescens Jack)*.

Ariani, L., Miftahurrohmah, N., & Winarti, W. (2020). Peningkatan Pengetahuan tentang Tanaman Obat Keluarga kepada Siswa Sekolah Dasar melalui Konseling, Flash Card, dan Berkebun Bersama. *Jurnal Pengabdian Kepada Masyarakat (Indonesian Journal of Community Engagement)*, *6*(1), 63. https://doi.org/10.22146/jpkm.52576

Arifuddin, M., Azmi, F. R., Bone, M., & Farah, H. I. (2025). Alkaloid Profiling of Kadamba (*Mitragyna speciosa* Korth . Havil .) Leaves through Chromatographic Separation and UV-Vis Spectrophotometery Analysis. *Journal of Pharmaceuticals and Natural Sciences*, *1*(1).

Aritonang, N. S., Sherlyn, Chiuman, L., & Rudy. (2022). Uji Identifikasi Senyawa Steroid Fraksi Ekstrak Metanol Andaliman (Zanthoxylum acthopodium DC) Secara Kromatografi Lapis Tipis. *Journal Health and Science*, *6*(1), 90–98.

Arrofiqi, M. R., Sakti, A. S., Dita, F., Farmasi, P. S., Kesehatan, F. I., Muhammadiyah, U., Kesehatan, F. I., Lamongan, U. M., Farmasi, D. T., Kesehatan, F. I., & Lamongam, M. (2024). *Kajian Literatur : Aplikasi Sejumlah Metode Ekstraksi Konvensional Untuk Mengekstraksi*. *7*(1).

Avula, B., Sagi, S., Wang, Y., Wang, M., Ali, Z., & SMillie, troy j. (2015). Identification and Characterization of Indole and Oxindole Alkaloids from

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Leaves of *Mitragyna speciosa* Korth Using Liquid Chromatography–Accurate QToF Mass Spectrometry Bharathi. *JournAl of AoAC InternAtIonAl*, 13–22. https://doi.org/10.5740/jaoacint.14-110

Ayuwardani, N., Ikawati, Z., Fakhrudin, N., & Muttaqien Sofro, Z. (2024). Possible Mechanism of Antidepressant Action from Phyllanthus Emblica Fruit using Pharmacological Network Analysis and Molecular Docking. *Acta Scientific Neurology*, *7*(12), 35–46. https://doi.org/10.31080/asne.2024.07.0790

Azzahra, V. O., Mardiana, S., Suharyadi, Sianipar, R. J., & Ramadhan, D. S. (2025). Effect of Solvent Polarity on Extraction Yield, Phytochemical Composition, and Antioxidant Activity of Curcuma xanthorrhiza Roxb. and Moringa oleifera Lam. *Biology, Medicine & Natural Product Chemistry*, *14*. https://doi.org/10.14421/biomedich.2025.142.***

Begum, T., Arzmi, M. H., Khatib, A., Helal Uddin, A. H., Abdullah, M., Rullah, K., Mat So'ad, S. Z., Zulaikha Haspi, N. F., Nazira Sarian, M., Parveen, H., Mukhtar, S., & Ahmed, Q. U. (2025). A review on *Mitragyna speciosa* (Rubiaceae) as a prominent medicinal plant based on ethnobotany, phytochemistry and pharmacological activities. *Natural Product Research*, *39.0*(6), 1636–1652. https://doi.org/10.1080/14786419.2024.2371564

Begum, T., Arzmi, M. H., Khatib, A., Uddin, A. B. M. H., Aisyah Abdullah, M., Rullah, K., Mat So'ad, S. Z., Zulaikha Haspi, N. F., Nazira Sarian, M., Parveen, H., Mukhtar, S., & Ahmed, Q. U. (2024). A review on *Mitragyna speciosa* (Rubiaceae) as a prominent medicinal plant based on ethnobotany, phytochemistry and pharmacological activities. *Natural Product Research*. https://doi.org/10.1080/14786419.2024.2371564

Berdgaleeva, A., Zhalimova, Z., Saginbazarova, A., Tulegenova, G., Ramazanova, A., Bilkenova, A., & Sartayeva, A. (2025). Comparative Phytochemical Analysis and Antimicrobial Properties of Ethanol and Macerated Extracts from Aerial and Root Parts of Achillea nobilis. *Molecules*, 1–30.

Bogucka-Kocka, A., & Zalewski, D. (2017). Qualitative and quantitative determination of main alkaloids of chelidonium majus L. using thin-layer chromatographic-densitometric method. *Acta Chromatographica*, *29*(3), 385–397. https://doi.org/10.1556/1326.2017.29.3.09

Caputi, L., Franke, J., Farrow, S. C., Chung, K., Payne, R. M. E., Nguyen, T.-D., Dang, T.-T. T., Carqueijeiro, I. S. T., Koudounas, K., Bernonville, T. D. de, Ameyaw, B., Jones, D. M., Vieira, I. J. C., Courdavault, V., & O'Connor, S. E. (2018). Missing enzymes in the biosynthesis of the anticancer drug vinblastine in Madagascar periwinkle. *Plant Science*, *7*(June), 1235–1239.

Carreres, B. M., Bessaire, T., Desmarchelier, A., Mottier, P., & Delatour, T. (2022). Rapid and Reliable Data Treatment for the Control of Food Chemical Contaminants by LC-HRMS. *Food Additives and Contaminants - Part A*, *39*(11), 1785–1796. https://doi.org/10.1080/19440049.2022.2118865

Chana, N., Pechsiri, J., Thepthong, P., Pakee, R., Decha, W., & Kongsune, P. (2025). *Comparative Analysis of Mitragynine and Alkaloid Content in Cultivated M . speciosa Leaves and Their α -Glucosidase Inhibitory Activity*. *22*(12).

Chen, L., Fei, S., & Olatunji, O. J. (2022). LC/ESI/TOF-MS Characterization,

UNIVERSITAS
GADJAH MADA
**Aktivitas Penghambatan Enzim Dipeptidyl Peptidase-IV (DPP-Iv) dari Ekstrak Daun Kratom (Mitragyna
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Anxiolytic and Antidepressant-like Effects of *Mitragyna speciosa* Korth Extract in Diabetic Rats. *Molecules*, *27*(7). https://doi.org/10.3390/molecules27072208

Chinnapun, D. (2025). The Structure and Biological Activities With Health Benefits of Luteolin Glycosides From Plants. *Wiley*, 46. https://doi.org/10.1155/tswj/3066682

Chumanee, S., Thunta, J., Khoomsab, R., & Winyakul, C. (2025). Optimizing ultrasound-assisted extraction for 7-hydroxymitragynine and mitragynine in kratom enhanced quantification of. *CREATIVE SCIENCE*, *17*(1). https://doi.org/10.55674/cs.v17i1.258707

Cinosi, E., Martinotti, G., Simonato, P., Singh, D., Demetrovics, Z., Roman-Urrestarazu, A., Bersani, F. S., Vicknasingam, B., Piazzon, G., Li, J. H., Yu, W. J., Kapitány-Fövény, M., Farkas, J., Di Giannantonio, M., & Corazza, O. (2015). Following "the Roots" of Kratom (*Mitragyna speciosa*): The Evolution of an Enhancer from a Traditional Use to Increase Work and Productivity in Southeast Asia to a Recreational Psychoactive Drug in Western Countries. *BioMed Research International*, *2015*. https://doi.org/10.1155/2015/968786

Connor, S. E. O., & Maresh, J. J. (2006). Chemistry and biology of monoterpene indole alkaloid biosynthesis. *Natural Product Reports*, *23*, 532–547. https://doi.org/10.1039/b512615k

Duarte, M. O., Lunardelli, S., Kiekow, C. J., Stein, A. C., Müller, L., Stolz, E., Rates, S. M. K., & Gosmann, G. (2014). Phloroglucinol Derivatives Present an Antidepressant-like Effect in the Mice Tail Suspension Test (TST). *Natural Product Communications*, *9*(5), 671–674. https://doi.org/10.1177/1934578X1400900522

Dutta, U., Goswami, M. J., Seema, T., Payum, T., Ullah, T. N., Hui, P. K., & Kakati, D. (2024). Antibacterial, antidiabetic and antioxidant bioevaluation of Calamus leptospadix Griff. and isolation of a flavan type compound. *Heliyon*, *10*(14), e34638. https://doi.org/10.1016/j.heliyon.2024.e34638

Dwika, W., Putra, P., Agung, A., Oka Dharmayudha, G., & Sudimartini, L. M. (2016). Identifikasi Senyawa Kimia Ekstrak Etanol Daun Kelor (Moringa oleifera L) di Bali. *Indonesia Medicus Veterinus Oktober*, *5*(5), 464–473.

Elshikh, A. A., Garbi, M. I., Kabbashi, A. S., Ishag, O. A., Omer, A. B., & Ali, M. M. (2018). Detection of Alkaloid for 26 Plants Used in Ethnoveterinary Medicine in Sudan. *Journal of Biotechnology Research*, *4*(5), 19–28.

Fajriaty, I., Hariyanto, I. H., Saputra, I. R., & Silitonga, M. (2017). Skrining Fitokimia dan Analisis Kromatografi Lapis Tipis Dari Ekstrak Etanol Buah Lerak (*Sapindus Rarak*). *Jurnal Pendidikan Informatika Dan Sains*, *6*(2), 243–256.

Fakhrudin, N., Kurniailla, N. A., & Fatimah, K. N. (2020). Potensi Antioksidan Biji dan Daun Kacang Hijau (Vigna radiate L.) dan Studi Korelasinya Dengan Kadar Flavonoid Total. *Jurnal Penelitian Pascapanen Pertanian*, *17*(1), 48. https://doi.org/10.21082/jpasca.v17n1.2020.48-58

Febrianti, D. R., Mahrita, M., Ariani, N., Putra, A. M. P., & Noorcahyati, N. (2019). Uji Kadar Sari Larut Air Dan Kadar Sari Larut Etanol Daun Kumpai Mahung

UNIVERSITAS GADJAH MADA
Aktivitas Penghambatan Enzim Dipeptidyl Peptidase-IV (DPP-Iv) dari Ekstrak Daun Kratom (Mitragyna Speciosa Korth) dan Identifikasi Kandungan Kimianya
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

(Eupathorium inulifolium H.B.&K). *Jurnal Pharmascience*, *6*(2), 19. https://doi.org/10.20527/jps.v6i2.7346

Félix, R., Carmona, A. M., Félix, C., Novais, S. C., & Lemos, M. F. L. (2020). Industry-Friendly Hydroethanolic Extraction Protocols for Grateloupia turuturu UV-Shielding and Antioxidant Compounds. *Applied Sciences*, *10*.

Firmansyah, A., Sundalian, M., & Taufiq, M. (2021). Kratom (*Mitragyna speciosa* korth) for a new medicinal: A review of pharmacological and compound analysis. *Biointerface Research in Applied Chemistry*, *11*(2), 9704–9718. https://doi.org/10.33263/BRIAC112.97049718

Flores-Bocanegra, L., Raja, H. A., Graf, T. N., Augustinović, M., Wallace, E. D., Hematian, S., Kellogg, J. J., Todd, D. A., Cech, N. B., & Oberlies, N. H. (2020). The Chemistry of Kratom [*Mitragyna speciosa*]: Updated Characterization Data and Methods to Elucidate Indole and Oxindole Alkaloids. *Journal of Natural Products*, *83*(7), 2165–2177. https://doi.org/10.1021/acs.jnatprod.0c00257

Garcia, U. G., Vicente, A. B., Jebari, S., & Sebal, A. L.-. (2020). Costus ignus: Insulin plant and it's preparations as remedial approach for diabetes mellitus. *International Journal of Molecular Sciences*, 1–34.

Goh, Y. S., Karunakaran, T., Murugaiyah, V., Santhanam, R., Abu Bakar, M. H., & Ramanathan, S. (2021). Accelerated solvent extractions (Ase) of *Mitragyna speciosa* korth. (kratom) leaves: Evaluation of its cytotoxicity and antinociceptive activity. *Molecules*, *26.0*(12). https://doi.org/10.3390/molecules26123704

Guo, J., Gao, D., Lian, J., & Qu, Y. (2024). De novo biosynthesis of antiarrhythmic alkaloid ajmaline. *Nature Communications*, *15*, 457. https://doi.org/10.1038/s41467-024-44797-z

H, M. K. N., K, I. S., Fauziah, A., Zaridah, M. Z., Azman, M., Nazrin, C. S., & M, A. H. (2025). Optimization of *Mitragyna speciosa* (Korth.) Havil. extraction techniques. *Asian Journal of Pharmacognosy Research*, *9*(2), 28–38.

Hasmal, A. L., Iqbal, M., Triyandi, R., & Afriyani. (2025). Pengaruh Konsentrasi dan Volume Etanol Terhadap Rendemen Ekstrak Tanaman Tapak Liman (Elephantopus Scaber L.) Menggunakan Metode Maserasi. *Sains Medisina*, *4*(2), 55–59. https://doi.org/10.63004/snsmed.v4i2.856

Hassan, Z., Muzaimi, M., Navaratnam, V., Yusoff, N. H. M., Suhaimi, F. W., Vadivelu, R., Vicknasingam, B. K., Amato, D., Hörsten, S. Von, Ismail, N. I. W., Jayabalan, N., Hazim, A. I., Mansor, S. M., & Müller, C. P. (2013). From Kratom to mitragynine and its derivatives : Physiological and behavioural effects related to use , abuse , and addiction. *Neuroscience and Biobehavioral Reviews*, *37*(2), 138–151. https://doi.org/10.1016/j.neubiorev.2012.11.012

Hassan, Z., Singh, D., Wahida, F., Chear, N. J., Harun, N., Pike, C., Kaur, G., Hamizah, N., Najmi, S., Bakar, S., Sabrina, N., Yusof, M., Balasingam, V., Chawarski, M. C., Murugaiyah, V., & Ramanathan, S. (2023). Evaluation of toxicity profile of kratom (*Mitragyna speciosa* Korth) decoction in rats. *Regulatory Toxicology and Pharmacology*, *143*(May), 105466. https://doi.org/10.1016/j.yrtph.2023.105466

Helilusiatiningsih, N. (2021). Identifikasi Senyawa Kimia Pada Buah Segar Terung

UNIVERSITAS GADJAH MADA
Aktivitas Penghambatan Enzim Dipeptidyl Peptidase-IV (DPP-Iv) dari Ekstrak Daun Kratom (Mitragyna Speciosa Korth) dan Identifikasi Kandungan Kimianya
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Pokak (Solanum Torvum) Dengan Metode LCMS. *Journal of Food Technology and Agroindustry*, *3*(1), 1–12.

Herawatiningsih, R., Sabtiani, R., & Tavita, G. E. (2024). Etnobotani Tanaman Kratom (*Mitragyna speciosa*) Oleh Masyarakat Di Sekitar Das Labian Di Desa Labian Ira'ang Kecamatan Batang Lupar Kabupaten Kapuas Hulu. *Jurnal Hutan Lestari*, *12*(1), 167. https://doi.org/10.26418/jhl.v12i1.72344

Hervás, J., Tosi, D., García-Miquel, H., Barrera, D., Fernández-Pousa, C. R., & Sales, S. (2017). KLT-Based Interrogation Technique for FBG Multiplexed Sensor Tracking. *Journal of Lightwave Technology*, *35*(16), 3387–3392. https://doi.org/10.1109/JLT.2016.2613131

Hossain, M. U., Hossain, M. S., Dey, S., Rahman, A. B. . N., Chowdhury, Z. M., Bhattacharjee, A., Ahammad, I., Islam, M. N., Moniruzzaman, M., Hosen, M. B., Ahmed, I., Das, K. C., Keya, C. A., & Salimullah, M. (2023). In vivo and in silico experiment on *Mitragyna speciosa* offers new insight of antidiabetic potentials. *BioRxiv*, 1–41.

Huang, L., Xiang, L., Zhang, Y., Wang, Y., & Nie, Z. (2020). Simultaneous quantitative analysis of K+ and Tl+ in serum and drinking water based on UV–Vis spectra and chemometrics. *Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy*, *238*, 1–10. https://doi.org/10.1016/j.saa.2020.118392

Huang, Q., Li, Y., Yu, M., Lv, Z., Zhu, J., & Jiang, H. (2025). Global burden and risk factors of type 2 diabetes mellitus from 1990 to 2021 , with forecasts to 2050. *Frontiers in Endocrinology*, *August*, 1–13. https://doi.org/10.3389/fendo.2025.1538143

Huang, X., Wu, Y., Ni, Y., Xu, H., & He, Y. (2025). Global , regional , and national burden of type 2 diabetes mellitus caused by high BMI from 1990 to 2021 , and forecasts to 2045 : analysis from the global burden of disease study 2021. *Frontiers in Public Health*, *January*, 1–12. https://doi.org/10.3389/fpubh.2025.1515797

Ilmi, A. N., Hasibuan, F. R., Pujiyanti, A. S., & Kurniati, R. (2025). Immunomodulatory And Antidiabetic Potential Of Kratom (*Mitragyna speciosa*) On Animal Models: Potentials. *Biocaster: Jurnal Kajian Biologi*, *5*(3), 240–253.

International Diabetes Federation, 2025. (2025). *IDF Diabetes Atlas* (11th Editi). International Diabetes Federation.

Islami, R. G., Arlista, F., & Mufid, M. (2021). Studi Literatur Proses Pembuatan Minyak Dedak Padi (Rice Bran Oil) Menggunakan Metode Ekstraksi Padat-Cair. *DISTILAT: Jurnal Teknologi Separasi*, *7*(2), 579–584. https://doi.org/10.33795/distilat.v7i2.262

Kartika Sari, E., Maimunah, S., Karina Putri, M., Studi, P. S., Tinggi Ilmu Kesehatan Akbidyo, S., Parangtritis, J. K., & Yogyakarta, S. (2022). THE EFFECT OF MACERATION TIME ON TOTAL ALKALOID LEVELS IN BROCOLI (Brassica oleracea var. italica) BY USING UV-Vis SPECTROPHOTOMETRY METHOD. *Jurnal Jamu Kusuma*, *2*(1), 38–46.

Kemenkes. (2024). *Pedoman Nasional Pelayanan Klinis Tata Laksana Diabetes Melitus Pada Anak*. 1–119.

UNIVERSITAS
GADJAH MADA
**Aktivitas Penghambatan Enzim Dipeptidyl Peptidase-IV (DPP-Iv) dari Ekstrak Daun Kratom (Mitragyna
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Kemenkes RI. (2017). FARMAKOPE HERBAL INDONESIA ED. II. In *Jakarta: Departement Kesehatan Republik Indonesia*. https://doi.org/10.2307/jj.2430657.12

Kruegel, A. C., & Grundmann, O. (2018a). The medicinal chemistry and neuropharmacology of kratom: A preliminary discussion of a promising medicinal plant and analysis of its potential for abuse. *Neuropharmacology*, *134*, 108–120. https://doi.org/10.1016/j.neuropharm.2017.08.026

Kruegel, A. C., & Grundmann, O. (2018b). The medicinal chemistry and neuropharmacology of kratom: A preliminary discussion of a promising medicinal plant and analysis of its potential for abuse. *Neuropharmacology*, *134.0*, 108–120. https://doi.org/10.1016/j.neuropharm.2017.08.026

Kruegel, A. C., Uprety, R., & Grinnell, S. G. (2019). 7-Hydroxymitragynine is an active metabolite of mitragynine and a key mediator of its analgesic effects. *ACS Central Science*, *5*(6), 992–1001. https://doi.org/10.1021/acscentsci.9b00141

Kruegel, A. C., Uprety, R., Grinnell, S. G., Langreck, C., Pekarskaya, E. A., Rouzic, V. Le, Ansono, M., Gassaway, M. M., Pintar, J. E., Pasternak, G. W., Javitch, J. A., & Majumdar, S. (2019). 7 - Hydroxymitragynine Is an Active Metabolite of Mitragynine and a Key Mediator of Its Analgesic E ff ects. *ACS Central Science*. https://doi.org/10.1021/acscentsci.9b00141

Kumar, S., Urumarudappa, J., Tungphatthong, C., Lavanya, G., & Sukrong, S. (2026). Phytomedicine Plus therapeutic potential , and regulatory perspectives. *Phytomedicine Plus*, *6*(April).

Kurniawati, F., Fitria, D., Nainggolan, A. R. U., & Wardani, P. A. (2023). Identifikasi dan Karakterisasi Tanaman Kratom melalui Pendekatan Profil Kandungan Senyawa Penanda secara LC-HRMS QToF dan Penetapan Nilai Retention Index secara GCMS. *Eruditio : Indonesia Journal of Food and Drug Safety*, *3*(1), 79–90. https://doi.org/10.54384/eruditio.v3i1.141

Larasati, K. D., Rahmatillah, A., & Luthfiyanti, N. (2025). Analisis Perbandingan Kandungan Fitokimia Ekstrak Daun Nangka (Artocarpus Heterophyllus Lam.) Dengan Variasi Konsentrasi Pelarut. *Prosiding Seminar Informasi Kesehatan Nasional*, 190–196.

Lee, J. E., Jayakody, J. T. M., Kim, J. Il, Jeong, J. W., Choi, K. M., Kim, T. S., Seo, C., Azimi, I., Hyun, J. M., & Ryu, B. M. (2024). The Influence of Solvent Choice on the Extraction of Bioactive Compounds from Asteraceae: A Comparative Review. *Foods*, *13*(19), 3151. https://doi.org/10.3390/foods13193151

Lelono, A. A., Latifah, I. L., Herdiawan, H., & Cahyani, R. W. (2021). Extraction and identification of Mitragynine from the Kratom Leaf (*Mitragyna speciosa*) using HFC-134a subcritical system. *IOP Conference Series: Materials Science and Engineering*, *1011*(1). https://doi.org/10.1088/1757-899X/1011/1/012045

León, F., Habib, E., Adkins, J. E., Furr, E. B., & McCurdy, C. R. (2021). Phytochemical Characterization of *Mitragyna speciosa* (Kratom) and Its Alkaloids. *Plants*.

León, F., Habib, E., Adkins, J. E., Furr, E. B., McCurdy, C. R., & Cutler, S. J.

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

(2009). Phytochemical characterization of the leaves of *Mitragyna speciosa* grown in USA. *Natural Product Communications*, *4*(7), 907–910. https://doi.org/10.1177/1934578x0900400705

Lezoul, N. E. H., Belkadi, M., Fariborz, H., & Guillén, F. (2020). Extraction Processes with Several Solvents on Total Bioactive Compounds in Di ff erent Organs of Three. *Molecules*, *25*(4672), 1–15.

Limcharoen, T., Pouyfung, P., Ngamdokmai, N., Prasopthum, A., Ahmad, A. R., Wisdawati, W., Prugsakij, W., & Warinhomhoun, S. (2022). Inhibition of α-Glucosidase and Pancreatic Lipase Properties of *Mitragyna speciosa* (Korth.) Havil. (Kratom) Leaves. *Nutrients*, *14*(19), 1–15. https://doi.org/10.3390/nu14193909

Lu, X., Xie, Q., Pan, X., Zhang, R., Zhang, X., Peng, G., Zhang, Y., Shen, S., & Tong, N. (2024). Type 2 diabetes mellitus in adults: pathogenesis, prevention and therapy. *Signal Transduction and Targeted Therapy*, *9*(1), 262. https://doi.org/10.1038/s41392-024-01951-9

Makrilakis, K. (2019). The role of dpp-4 inhibitors in the treatment algorithm of type 2 diabetes mellitus: When to select, what to expect. *International Journal of Environmental Research and Public Health*, *16*(15). https://doi.org/10.3390/ijerph16152720

Manwill, P. K., Flores-Bocanegra, L., Khin, M., Raja, H. A., Cech, N. B., Oberlies, N. H., & Todd, D. A. (2022). Kratom (*Mitragyna speciosa*) Validation: Quantitative Analysis of Indole and Oxindole Alkaloids Reveals Chemotypes of Plants and Products #. *Planta Medica*, *88*(9–10), 838–852. https://doi.org/10.1055/a-1795-5876

Martha, R., Heriberto, A., Patricia, S., Carrera, P., Ramirez, A. M., Mota, M., Odin, S., & Valle, F. (2019). 3'-O-β-D-glucopyranosyl-α,4,2?,4?,6?-pentahydroxy-dihydrochalcone, from Bark of Eysenhardtia polystachya Prevents Diabetic Nephropathy via Inhibiting Protein Glycation in STZ-Nicotinamide Induced Diabetic Mice. *Molecules*, *24*, 1–13. https://doi.org/10.3390/molecules24071214

Masriani, M., Muharini, R., Wijayanti, D. K., Melanie, P., & Widiansari, M. L. (2023). Phytochemical Screening of Ethanol Extracts from Three Variants of Kratom Leaves (*Mitragyna speciosa* Korth.). *Hydrogen: Jurnal Kependidikan Kimia*, *11*(2), 192. https://doi.org/10.33394/hjkk.v11i2.7122

Mayasari, D., Murti, Y. B., Pratiwi, S. U. T., & Sudarsono, S. (2022). Antibacterial Activity and TLC-Densitometric Analysis of Secondary Metabolites in the Leaves of the Traditional Herb, Melastoma malabathricum L. *Borneo Journal of Pharmacy*, *5*(4), 334–344. https://doi.org/10.33084/bjop.v5i4.3818

Mcdougall, C., Mckay, G. A., Fisher, M., & Kilbride, E. (2011). *Drugs for diabetes : part 5 Copyright Medinews (Cardiology) Limited Reproduction Prohibited Copyright Medinews (Cardiology) Limited Reproduction Prohibited Copyright Medinews (Cardiology) Limited Reproduction Prohibited Copyright Medinews (Cardiolo*. *18*(3), 130–132.

Mewar, D., & Muhammad Fadhil As'ad. (2023). Standarisasi Parameter Spesifik dan Non Spesifik Ekstrak Etanol Daun Gatal (Laportea decumana(Roxb.) Wedd)Sebagai Bahan Baku Obat Herbal Terstandar. *Jurnal Penelitian*

UNIVERSITAS
GADJAH MADA
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Kesehatan Suara Forikes, *14*(April), 266–270.

Mikov, M., Pavlović, N., Stanimirov, B., Đanić, M., Goločorbin-Kon, S., Stankov, K., & Al-Salami, H. (2020). DPP-4 Inhibitors: Renoprotective Potential and Pharmacokinetics in Type 2 Diabetes Mellitus Patients with Renal Impairment. *European Journal of Drug Metabolism and Pharmacokinetics*, *45*(1). https://doi.org/10.1007/s13318-019-00570-y

Mukhriani. (2014). EKSTRAKSI, PEMISAHAN SENYAWA, DAN IDENTIFIKASI SENYAWA AKTIF. *Jurnal Agripet*, *7*(2).

Musoev, A., Numonov, S., You, Z., & Gao, H. (2019). Discovery of novel DPP-IV inhibitors as potential candidates for the treatment of type 2 diabetes mellitus predicted by 3D QSAR pharmacophore models, molecular docking and de novo evolution. *Molecules*, *24*(16), 1–13. https://doi.org/10.3390/molecules24162870

Nauck, M. A., Quast, D. R., Wefers, J., & Pfeiffer, A. F. H. (2021). The evolving story of incretins (GIP and GLP-1) in metabolic and cardiovascular disease: A pathophysiological update. *Diabetes, Obesity and Metabolism*, *23*(S3), 5–29. https://doi.org/10.1111/dom.14496

Ncama, K., Malele, J., & Anumanthoo, T. (2025). Effectiveness of Common Extraction Solvents in Obtaining Antioxidant Compounds from African Medicinal Plants. *Antioxidants*, *14*, 1498.

Niah, R., & Kumalasari, E. (2019). Profil Senyawa Dan Aktivitas Antioksidan Ekstrak Daun Sepat (Mitragynaspeciosa) Dan Daun Dadangkak (Hydrolea Spinosa L.). *Jurnal Ilmiah Ibnu Sina (JIIS): Ilmu Farmasi Dan Kesehatan*, *4*(2), 391–399. https://doi.org/10.36387/jiis.v4i2.352

Niyomdecha, M., Muandao, K., Kuttiyod, T., & Sanongkiet, S. (2022). α -glucosidase inhibition activities of crude extract and mitragynine from *Mitragyna speciosa* Korth. *International Journal of Health Sciences*, *6*(April), 10254–10261.

Novianry, V., & Astuti, P. (2024). Comparative Analysis of Mitragynine Content in Kratom Leaves (*Mitragyna speciosa* Korth) from Kabupaten Kapuas Hulu Using HPLC Method. *Sciscitatio Journal for Biological Science*, *5*(2), 87–93.

Nuralifah, N., Parawansah, P., & Nur, H. (2021). Uji Toksisitas Akut Ekstrak Air Dan Ekstrak Etanol Daun Kacapiring (Gardenia jasminoides Ellis) Terhadap Larva Artemia Salina Leach Dengan Metode Brine Shrimp Lethality Test (BSLT). *Indonesian Journal of Pharmaceutical Education*, *1*(2), 98–106. https://doi.org/10.37311/ijpe.v1i2.11462

Nwankwo, N. E., Okeke, E. S., Nworah, F. N., & Ezeako, E. C. (2023). Phytochemical composition and potential anti-inflammatory and antioxidant mechanisms of leaf extracts of Sida linifolia L. (Malvaceae). *Journal of Herbal Medicine*, *38*(January). https://doi.org/10.1016/j.hermed.2023.100630

O'Connor, S. E., & Maresh, J. J. (2006). Chemistry and biology of monoterpene indole alkaloid biosynthesis. *Natural Product Reports*, *23*(4), 532–547. https://doi.org/10.1039/B512615K

Paankhao, N., Sangsawang, A., Kantha, P., Paankhao, S., Promsee, K., Soontara, C., Kongsriprapan, S., Srisapoome, P., Kumwan, B., Meachasompop, P., Phrompanya, P., Buncharoen, W., & Uchuwittayakul, A. (2024). Antioxidant

UNIVERSITAS
GADJAH MADA
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and antibacterial efficiency of the ethanolic leaf extract of Kratom (*Mitragyna speciosa* (Korth.) Havil) and its effects on growth, health, and disease resistance against Edwardsiella tarda infection in Nile tilapia (Oreochromis niloticus). *Fish and Shellfish Immunology*, *152*. https://doi.org/10.1016/j.fsi.2024.109771

Parthasarathy, S., Ramanathan, S., & Murugaiyah, V. (2013). A simple HPLC – DAD method for the detection and quantification of psychotropic mitragynine in *Mitragyna speciosa* (ketum) and its products for the application in forensic investigation. *Forensic Science International*, *226*(1–3), 183–187. https://doi.org/10.1016/j.forsciint.2013.01.014

Patel, N., Prajapati, A. K., Jadeja, R. N., Patel, R. N., Patel, S. K., Gupta, V. K., Tripathi, I. P., & Dwivedi, N. (2019). Model investigations for vanadium-protein interactions: Synthesis, characterization and antidiabetic properties. *Inorganica Chimica Acta*, *493*(April), 20–28. https://doi.org/10.1016/j.ica.2019.04.050

Pebe, M. A. P. (2022). Uji Konfirmasi Morfin dengan Metode KLT. *Jurnal Ilmiah Multi Disiplin Indonesia*, *1*(7), 867–876.

Pipatrattanaseree, W., Intareeya, C., Koonnoot, S., Ontong, S., Thitiporn, T., Rattanajarasroj, S., Chaisomboonpan, S., & Yoon, A. S. (2023). *Original Article Exploring the Enzymatic-Based Biological Activities of*. *21*(3).

Pratami, D. K., Alfifah, S. C., Islam, I., Sahlan, M., & Angky, S. R. I. (2024). Analysis Of Propolis Stingless Bee Bioactive Compounds From Several Regions In Indonesia. *International Journal of Applied Pharmaceutics*, *16*(3), 77–82.

Prawitasari, D. S. (2019). Diabetes Melitus dan Antioksidan. *Jurnal Kesehatan Dan Kedokteran*, *1*(1), 47–51.

Prevete, E., Kuypers, K. P. C., Theunissen, E. L., Corazza, O., Bersani, G., & Ramaekers, J. G. (2022). A systematic review of (pre)clinical studies on the therapeutic potential and safety profile of kratom in humans. *Wiley*, *July 2021*. https://doi.org/10.1002/hup.2805

Prozialeck, W. C., Avery, B. A., Boyer, E. W., Grundmann, O., Henningfield, J. E., Kruegel, A. C., McMahon, L. R., McCurdy, C. R., Swogger, M. T., Veltri, C. A., & Singh, D. (2019). Kratom policy: The challenge of balancing therapeutic potential with public safety. *International Journal of Drug Policy*, *70.0*, 70–77. https://doi.org/10.1016/j.drugpo.2019.05.003

Purintrapiban, J., Keawpradub, N., Kansenalak, S., Chittrakarn, S., Janchawee, B., & Sawangjaroen, K. (2011). Study on glucose transport in muscle cells by extracts from *Mitragyna speciosa* (Korth) and mitragynine. *Natural Product Research*, *25*(15), 1379–1387. https://doi.org/10.1080/14786410802267627

Purnamasari, F. (2021). Identifikasi Senyawa Aktif dari Ekstrak Daun Sirsak (Annona muricata L.) dengan Perbandingan Beberapa Pelarut pada Metode Maserasi. *Window of Health : Jurnal Kesehatan*, *04*(03), 231–237. https://doi.org/10.33096/woh.v4i03.234

Purwayantie, S., Fadly, D., Saputri, N. E., & Wijanarti, S. (2022). Antioxidant Activity from Multiple Extraction of Kratom Leaf (*Mitragyna speciosa*) without Veins with Sonicator-Type Bath. *Journal of Health and Nutrition*

UNIVERSITAS
GADJAH MADA
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Research, *1*(3), 178–184.

Qaderi, M. M., Martel, A. B., & Strugnell, C. A. (2023). Environmental Factors Regulate Plant Secondary Metabolites. *Plants*, *12*(3), 1–27. https://doi.org/10.3390/plants12030447

Qu, Y., Easson, M. E. A. M., Simionescu, R., Hajicek, J., Thamm, A. M. K., & Salim, V. (2018). Solution of the multistep pathway for assembly of corynanthean, strychnos, iboga, and aspidosperma monoterpenoid indole alkaloids from 19E-geissoschizine. *PNAS Latest Articles*, 1–6. https://doi.org/10.1073/pnas.1719979115

Richter, M. M., Galsgaard, K. D., Elmelund, E., Knop, F. K., Suppli, M. P., Holst, J. J., Winther-Sørensen, M., Kjeldsen, S. A. S., & Albrechtsen, N. J. W. (2022). The Liver–a-Cell Axis in Health and in Disease. *Diabetes*, *71*(9), 1852–1861. https://doi.org/10.2337/dbi22-0004

Ridho, M. H., Gani, A. P., Wahyuono, S., & Fakhrudin, N. (2020). Application of Ultrasonic-Assisted Fractionation with Full-Factorial Design for the Production of Alkaloid-Rich Fraction from Ficus septica Leaves. *Journal of Food and Pharmaceuticval Sciences*, *8*(3), 294–305.

Riski, A., Fakhrudin, N., Nugroho, A. E., Niah, R., & Hidayat, L. H. (2026). Potensi Aktivitas Antioksidan Dan Penetapan Kadar Fenolik Total Ekstrak Daun Kratom (*Mitragyna speciosa* Korth.) Menggunakan Variasi Pelarut. *Jurnal Ilmiah Ibnu Sina (JIIS): Ilmu Farmasi Dan Kesehatan*, *11*(1), 65–73.

Rohani, Febrina, E., Wahyuni, I. S., & Levita, J. (2023). Pharmacological and Clinical Studies of Medicinal Plants That Inhibit Dipeptidyl Peptidase-IV. *Drug Design, Development and Therapy*, *October*.

Rohmah, J., Saidi, I. A., Rini, C. S., Masyitha, D. A., Ramadhani, D. N., & Wulandari, H. P. (2020). Aktivitas Antioksidan Ekstrak Etanol, Etil Asetat, Dan N- Heksana Batang Turi Putih (Sesbania Grandiflora (L.) Pers.) Dengan Metode Dpph (1,1-Diphenyl-2-Picrylhydrazyl). *Jurnal Kimia Riset*, *5*(1), 67–85.

Rusmadi, N. N., Karunakaran, T., Ramli, F., Ismail, I. S., Santhanam, R. K., Jagabalan, J. D. Y., Bakar, M. H. A., Muhamad, A., & Ramanathan, S. (2025). Optimization of a Green Extraction Technique for Kratom (Ketum) Leaf Extract via Accelerated Solvent Extraction: Phytochemical Profiles, Cytotoxicity, and Antinociceptive Activity. *ACS Pharmacology & Translational Science*, *9*(1), 126–140. https://doi.org/10.1021/acsptsci.5c00647

Rusydan, A. M., Lukitaningsih, E., & Fakhrudin, N. (2021). Modeling and Optimization of *Mitragyna speciosa* Extraction using Box Behnken Design. *Majalah Obat Tradisional*, *26*(3), 204–210. https://doi.org/10.22146/mot.68610

Samudra, A. G., Nugroho, A. E., & Murwanti, R. (2025). Antioxidant and DPP-IV inhibitory activities of Sargassum cristaefolium extract : A therapeutic potential agent for type-2 diabetes. *BIO Web of Conferences*, *02001*, 1–12.

Sarian, M. N., Ahmed, Q. U., Mat So'Ad, S. Z., Alhassan, A. M., Murugesu, S., Perumal, V., Syed Mohamad, S. N. A., Khatib, A., & Latip, J. (2017). Antioxidant and antidiabetic effects of flavonoids: A structure-activity

UNIVERSITAS
GADJAH MADA
**Aktivitas Penghambatan Enzim Dipeptidyl Peptidase-IV (DPP-Iv) dari Ekstrak Daun Kratom (Mitragyna
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relationship based study. *BioMed Research International*, *2017*. https://doi.org/10.1155/2017/8386065

Setyaningsih, E. P., Saputri, F. C., & Mun'im, A. (2019). The Antidiabetic Effectivity of Indonesian Plants Extracts via DPP-IV Inhibitory Mechanism. *Journal of Young Pharmacists*, *11*(2), 161–164. https://doi.org/10.5530/jyp.2019.11.34

Setyawati, H., & Lestari, S. P. (2020). Uji Aktivitas Antioksidan Ekstrak Etanol Daun Kratom (*Mitragyna speciosa*) dengan Metode 1,1-Difenil-2-Pikrilhidrazil (DPPH). *Jurnal Farmasi Udayana*, *9*(3), 213–220. https://doi.org/10.24843/JFU.2020.v09.i03.p09

Shaikh, S., Lee, E. J., Ahmad, K., Ahmad, S. S., Lim, J. H., & Choi, I. (2021). A comprehensive review and perspective on natural sources as dipeptidyl peptidase-4 inhibitors for management of diabetes. *Pharmaceuticals*, *14*(6). https://doi.org/10.3390/ph14060591

Shamsa, F., Monsef, H., Ghamooshi, R., & Verdian-rizi, M. (2008). Spectrophotometric determination of total alkaloids in some Iranian medicinal plants Abstract : *Thai J. Pharm. Sci*, *32*(1), 17–20.

Singh, A. K., Yadav, D., Sharma, N., & Jin, J.-O. (2021). Dipeptidyl peptidase (Dpp)-iv inhibitors with antioxidant potential isolated from natural sources: A novel approach for the management of diabetes. *Pharmaceuticals*, *14*(6). https://doi.org/10.3390/ph14060586

Singh, D., Narayanan, S., & Vicknasingam, B. (2016). Traditional and non-traditional uses of Mitragynine (Kratom): A survey of the literature. *Brain Research Bulletin*, *126*, 41–46. https://doi.org/10.1016/j.brainresbull.2016.05.004

Singh, D., Narayanan, S., Vicknasingam, B., Corazza, O., Santacroce, R., & Roman-Urrestarazu, A. (2017). Changing trends in the use of kratom (*Mitragyna speciosa*) in Southeast Asia. *Human Psychopharmacology*, *32*(3), 1–6. https://doi.org/10.1002/hup.2582

Stella, R., Sette, G., Moressa, A., Gallina, A., Aloisi, A. M., Angeletti, R., & Biancotto, G. (2020). LC-HRMS/MS for the simultaneous determination of four allergens in fish and swine food products. *Food Chemistry*, *331*(October 2019). https://doi.org/10.1016/j.foodchem.2020.127276

Sundari, T. K., Bachri, M. S., Nurani, L. H., Widyaningsih, W., & Ma'ruf, M. (2025). Profil Kandungan Fenolik Dan Evaluasi Parameter Non- Spesifik Ekstrak Etanol Rimpang Jahe Merah (Zingiber Officinale Var. Rubrum). *Jurnal Insan Farmasi Indonesia*, *8*(2), 449–460. https://doi.org/10.36387/jifi.v8i2.2832

Syafrinal, & Ramadhani, S. (2019). Uji Aktivitas Antioksidan Ekstrak Kulit Batang Dalu-Dalu Menggunakan Metode DPPH. *Jurnal Teknologi Pertanian*, *8*(1), 1–7.

Syarifuddin, A., Nurrochmad, A., & Fakhrudin, N. (2025). Study on the anti-inflammatory activity of Polyscias scutellaria (Burm. F.) fosberg leaves extract and its phytochemical components. *Journal of Applied Pharmaceutical Science*, *15*(08), 147–155. https://doi.org/10.7324/japs.2025.218746

Szumilo, M., Wronikowska-Denysiuk, O., & Czuczwar, S. J. (2020). Yohimbine

UNIVERSITAS GADJAH MADA
Aktivitas Penghambatan Enzim Dipeptidyl Peptidase-IV (DPP-Iv) dari Ekstrak Daun Kratom (Mitragyna Speciosa Korth) dan Identifikasi Kandungan Kimianya
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and rauwolscine alkaloids: Biological activities and therapeutic perspectives. *Molecules*, *25*(21), 4938. https://doi.org/10.3390/molecules25214938

Tabudravu, J. N., Pellissier, L., Smith, A. J., Subko, K., Autréau, C., Feussner, K., Hardy, D., Butler, D., Kidd, R., Milton, E. J., Deng, H., Ebel, R., Salonna, M., Gissi, C., Montesanto, F., Kelly, S. M., Milne, B. F., Cimpan, G., & Jaspars, M. (2019). LC-HRMS-Database screening metrics for rapid prioritization of samples to accelerate the discovery of structurally new natural products. *Journal of Natural Products*, *82*(2), 211–220. https://doi.org/10.1021/acs.jnatprod.8b00575

Tangka, J., Barung, E. N., Lyrawati, D., Soeatmadji, D., & Nurdiana, N. (2022). DPP-IV Inhibitory Activity of the Ethanolic Extract of Red Gedi Leaves Abelmoschus manihot L. Medic. *Open Access Macedonian Journal of Medical Sciences*, *10*, 207–213. https://doi.org/10.3889/oamjms.2022.8356

Tanty, H., Aryusmar, Permai, S. D., & Bustanussalam. (2021). The Effect of Differences in Extraction of Cassia Siamea . Lamk Leaves in Etoh 70 % and Etoh 90 % Against The Inhibition of The A-Glucosidase Enzyme The Effect of Differences in Extraction of Cassia Siamea . Lamk Leaves in Etoh 70 % and Etoh 90 % Against. *Journal of Physics: Conference Series PAPER*, 1752. https://doi.org/10.1088/1742-6596/1752/1/012056

Theresa, M., Nastiti, K., & Wusko, I. U. (2021). Thin Layer Chromatography Profile Of Secondary Metabolites In Tampala Trunk Extract (Spatholobus Littoralis Hassk) Refbacks. *Proceeding International Conference on Health Science*, *1*, 306–219.

Tourabi, M., Faiz, K., Ezzouggari, R., Louasté, B., Merzouki, M., Dauelbait, M., Bourhia, M., Almaary, K. S., Siddique, F., Lyoussi, B., & Derwich, E. (2025). Optimization of Extraction Process and Solvent Polarities to Enhance the Recovery of Phytochemical Compounds, Nutritional Content, and Biofunctional Properties of Mentha longifolia L. Extracts. *Bioresources and Bioprocessing*, *12*, 24. https://doi.org/10.1186/s40643-025-00859-8

Tundis, R., Loizzo, M. R., & Menichini, F. (2010). Natural Products as -Amylase and -Glucosidase Inhibitors and their Hypoglycaemic Potential in the Treatment of Diabetes : An Update. *Mini-Reviews in Medicinal Chemistry*, *10*, 315–331.

Veltri, C., & Grundmann, O. (2019). Current perspectives on the impact of Kratom use . *Substance Abuse and Rehabilitation*, *Volume 10*, 23–31. https://doi.org/10.2147/sar.s164261

Wahyono, S. (2019). *Kratom: Prospek Kesehatan dan Sosial Ekonomi*. Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan.

Wahyono, S., Widowati, L., Handayani, L., Sampurno, O. D., Haryanti, S., Fauzi, Ratnawati, G., & Budiarti, M. (2019). Kratom. In *Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan RI*. https://doi.org/10.1071/HC22110

Wahyuni, S., & Marpaung, M. P. (2020). Penentuan Kadar Alkaloid Total Ekstrak Akar Kuning (Fibraurea Chloroleuca Miers) Berdasarkan Perbedaan Konsentrasi Etanol Dengan Metode Spektrofotometri Uv-Vis. *Dalton : Jurnal Pendidikan Kimia Dan Ilmu Kimia*, *3*(2), 52–61.

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https://doi.org/10.31602/dl.v3i2.3911

Wang, Y., Wang, H., Tao, Y., Zhang, S., Wang, J., & Feng, X. (2020). Terpenoids as potential therapeutic agents for diabetes mellitus and its complications. *Biomedicine & Pharmacotherapy*, *130*, 110485. https://doi.org/10.1016/j.biopha.2020.110485

Wangmo, K. S., Wungsintaweekul, J., Zhu, Z., Yang, M., & Jaisi, A. (2026). A review on Mitragyna alkaloids pharmacology, biosynthesis and biotechnological insights. *Journal of Genetic Engineering and Biotechnology*, *24*(2). https://doi.org/10.1016/j.jgeb.2026.100710

Wijaya, H., Jubaidah, S., & Rukayyah, R. (2022). Perbandingan Metode Esktraksi Terhadap Rendemen Ekstrak Batang Turi (Sesbania Grandiflora L.) Dengan Menggunakan Metode Maserasi Dan Sokhletasi. *Indonesian Journal of Pharmacy and Natural Product*, *5*(1), 1–11. https://doi.org/10.35473/ijpnp.v5i1.1469

Wijayanti, D. K., Fadly, D., Muharini, R., & Rasmawan, R. (2023). *Inhibition of α -Glucosidase Enzyme by Ethanol Extract of Kratom Leaf Variant (Mitragyna speciosa Korth.)*. *11*(June).

Wijayanti, D. K., Masriani, M., Fadly, D., Muharini, R., & Rasmawan, R. (2023). Inhibition of α-Glucosidase Enzyme by Ethanol Extract of Kratom Leaf Variant (*Mitragyna speciosa* Korth.). *Hydrogen: Jurnal Kependidikan Kimia*, *11*(3), 286. https://doi.org/10.33394/hjkk.v11i3.7776

Wilson, W. B., Coskun, S. H., Mulloor, J., Nelson, M. A., & Yen, J. H. (2024). Certification of Standard Reference Material 1976B. In *NIST Special Publication 260* (Vol. 30, Issue 3). https://doi.org/10.1017/S0885715615000445

Windarsih, A., Suratno, Warmiko, H. D., Indrianingsih, A. W., Rohman, A., & Ulumuddin, Y. I. (2022). Untargeted metabolomics and proteomics approach using liquid chromatography-Orbitrap high resolution mass spectrometry to detect pork adulteration in Pangasius hypopthalmus meat. *Food Chemistry*, *386*(March), 132856. https://doi.org/10.1016/j.foodchem.2022.132856

Yuniarti, R., Nadia, S., Alamanda, A., Zubir, M., Syahputra, R. A., & Nizam, M. (2020). Characterization , Phytochemical Screenings and Antioxidant Activity Test of Kratom Leaf Ethanol Extract (*Mitragyna speciosa* Korth) Using DPPH Method Characterization , Phytochemical Screenings and Antioxidant Activity Test of Kratom Leaf Ethanol Extrac. *Journal of Physics: Conference Series PAPER*. https://doi.org/10.1088/1742-6596/1462/1/012026

Zaini, M., Shofia, V., Ajrina, A., Studi, P., Farmasi, D.-I., Kalimantan, P. U., Analis, D.-I., Politeknik, K., Kalimantan, U., Hidayatullah, J. P., 10, N., Komplek, R. 14, Futsal, U., & Anyar, B. (2017). *Penentuan Aktivitas Fraksi Nonpolar dari Ekstrak Etanol Akar Dadangkak (Hydrolea spinosa L.) terhadap Penurunan Kadar Glukosa Darah Tikus Jantan yang Diinduksi Aloksan Activity Determination of Nonpolar Fraction from Ethanol Extract of Dadangkak Root (Hydrolea spinosa L.) to Decrease Blood Glucose Levels of Male Rat Induced by Aloxan*. *15*(1), 26–32.

Zakaria, F., Razak, N. H. Z. A., Mohd Faudzi, S. M., Abdul Rahman, M. B. A., & Ashari, S. E. (2022). Statistical optimisation of *Mitragyna speciosa* leaves

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**Aktivitas Penghambatan Enzim Dipeptidyl Peptidase-IV (DPP-Iv) dari Ekstrak Daun Kratom (Mitragyna
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extract via central composite design and its phytochemical characterisation. *AIP Conference Proceedings*, *2454.0*. https://doi.org/10.1063/5.0081931

Zhang, C., Gao, S., Zhang, C., Zhang, Y., Liu, H., Hong, H., & Luo, Y. (2020). Evaluating in vitro dipeptidyl peptidase IV inhibition by peptides from common carp (*Cyprinus carpio*) roe in cell culture models. *European Food Research and Technology*, *246*(1), 179–191. https://doi.org/10.1007/s00217-019-03399-6

Zhang, J., Qian, X. K., Song, P. F., Li, X. D., Wang, A. Q., Huo, H., Yao, J. C., Zhang, G. M., & Zou, L. W. (2021). A high-throughput screening assay for *dipeptidyl peptidase*-IV inhibitors using human plasma. *Analytical Methods*, *13*(24), 2671–2678. https://doi.org/10.1039/d1ay00415h

Zhang, P., Wei, W., Zhang, X., Wen, C., Ovatlarnporn, C., & Olatunji, O. J. (2023). Antidiabetic and antioxidant activities of *Mitragyna speciosa* (kratom) leaf extract in type 2 diabetic rats. *Biomedicine and Pharmacotherapy*, *162*. https://doi.org/10.1016/j.biopha.2023.114689