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DAFTAR PUSTAKA

Abbas, I. K., & Abd-AlHammid, N. S. N. (2023). Design, Optimization and characterization of Self-Nanoemulsifying drug delivery Systems of Bilastine. *Iraqi Journal of Pharmaceutical Sciences (P-ISSN 1683 - 3597 E-ISSN 2521 - 3512)*, *32*(Suppl.), 164–176. https://doi.org/10.31351/vol32isssuppl.pp164-176

Adiansyah, M., Mahati, E., Mundhofir, F., Maharani, N., Nindita, Y., & Istiadi, H. (2022). Effect of piper Crocatum leaves extract on atherosclerosis in diabetic rats. *Journal of Advanced Biotechnology and Experimental Therapeutics*, *6*(1), 254. https://doi.org/10.5455/jabet.2023.d123

Alberts, A., Bratu, A. G., Niculescu, A., & Grumezescu, A. M. (2025). Collagen-Based wound Dressings: Innovations, mechanisms, and clinical applications. *Gels*, *11*(4), 271. https://doi.org/10.3390/gels11040271

Amalia, A., Maslikah, S. I., & Lestari, S. R. (2020). Virtual screening flavonoid compounds from red betel (Piper crocatum Ruiz & Pav.) as inhibitor of cyclooxygenase-2 (COX-2). *AIP Conference Proceedings*. https://doi.org/10.1063/5.0002567

Amberger, J. S., Bocchini, C. A., Scott, A. F., & Hamosh, A. (2018). OMIM.org: leveraging knowledge across phenotype–gene relationships. *Nucleic Acids Research*, *47*(D1), D1038–D1043. https://doi.org/10.1093/nar/gky1151

Amin, J., Sharif, M., Anjum, M. A., Khan, H. U., Malik, M. S. A., & Kadry, S. (2020). An integrated design for classification and localization of diabetic

UNIVERSITAS GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA
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foot ulcer based on CNN and YOLOV2-DFU models. *IEEE Access*, *8*, 228586–228597. https://doi.org/10.1109/access.2020.3045732

Amler, E., Filová, E., Buzgo, M., Prosecká, E., Rampichová, M., Nečas, A., Nooeaid, P., & Boccaccini, A. R. (2014). Functionalized Nanofibers as Drug-Delivery Systems for osteochondral regeneration. *Nanomedicine*, *9*(7), 1083–1094. https://doi.org/10.2217/nnm.14.57

Anindhita, M. A., & Oktaviani, N. (2014). Formulasi Self-Nanoemulsifying Drug Delivery System (SNEDDS) Ekstak Daun Pepaya (Carica papaya L.) dengan Virgin Coconut Oil (VCO) sebagai Minyak Pembawa. *JURNAL PENA MEDIKA*, *6*(2), 103–111.

Ansari, M. J., Alshetaili, A., Aldayel, I. A., Alablan, F. M., Alsulays, B., Alshahrani, S., Alalaiwe, A., Ansari, M. N., Rehman, N. U., & Shakeel, F. (2020). Formulation, characterization, in vitro and in vivo evaluations of self-nanoemulsifying drug delivery system of luteolin. *Journal of Taibah University for Science*, *14*(1), 1386–1401. https://doi.org/10.1080/16583655.2020.1812269

Arbain, D., Nofrizal, N., Syafni, N., Ismed, F., Yousuf, S., & Choudhary, M. I. (2018). Bicyclo[3.2.1]octanoid neolignans from Indonesian red betle leaves (Piper crocatum Ruiz & Pav.). *Phytochemistry Letters*, *24*, 163–166. https://doi.org/10.1016/j.phytol.2018.02.006

Aryani, H., Akbar, N. F., Kurniatin, P. A., Fuad, A. M., & Ambarsari, L. (2024). Optimization of PCR Conditions for Adding XhoI Restriction Sites to the

UNIVERSITAS
GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Glucose Oxidase Gene of Aspergillus niger IPBCC 08.610. *Current Biochemistry*, *11*(1), 14–23. https://doi.org/10.29244/cb.11.1.2

Bigg, H. F., Rowan, A. D., Barker, M. D., & Cawston, T. E. (2007). Activity of matrix metalloproteinase-9 against native collagen types I and III. *FEBS Journal*, *274*(5), 1246–1255. https://doi.org/10.1111/j.1742-4658.2007.05669.x

Buya, A. B., Beloqui, A., Memvanga, P. B., & Préat, V. (2020). Self-Nano-Emulsifying Drug-Delivery Systems: From the development to the current applications and challenges in oral drug delivery. *Pharmaceutics*, *12*(12), 1194. https://doi.org/10.3390/pharmaceutics12121194

Chatterjee, B., Almurisi, S. H., Dukhan, A. a. M., Mandal, U. K., & Sengupta, P. (2016). Controversies with self-emulsifying drug delivery system from pharmacokinetic point of view. *Drug Delivery*, *23*(9), 3639–3652. https://doi.org/10.1080/10717544.2016.1214990

Chauhan, A., Kamal, R., Mishra, R., Shekho, D., & Awasthi, A. (2024). A comprehensive guide to the development, evaluation, and future prospects of self-nanoemulsifying drug delivery systems for poorly water-soluble drugs. *Current Pharmaceutical Design*, *30*(16), 1211–1216. https://doi.org/10.2174/0113816128296705240327065131

Czajkowska-Kośnik, A., Szekalska, M., Amelian, A., Szymańska, E., & Winnicka, K. (2015). Development and evaluation of Liquid and Solid Self-Emulsifying

PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA
DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Drug delivery systems for Atorvastatin. *Molecules*, *20*(12), 21010–21022. https://doi.org/10.3390/molecules201219745

De Oliveira Gonzalez, A. C., Costa, T. F., De Araújo Andrade, Z., & Medrado, A. R. a. P. (2016). Wound healing - A literature review. *Anais Brasileiros De Dermatologia*, *91*(5), 614–620. https://doi.org/10.1590/abd1806-4841.20164741

Dejica, V. M., Mort, J. S., Laverty, S., Antoniou, J., Zukor, D. J., Tanzer, M., & Poole, A. R. (2012). Increased type II collagen cleavage by cathepsin K and collagenase activities with aging and osteoarthritis in human articular cartilage. *Arthritis Research & Therapy*, *14*(3). https://doi.org/10.1186/ar3839

Dostal, D., Glaser, S., & Baudino, T. A. (2015). Cardiac fibroblast physiology and Pathology. *Comprehensive Physiology*, 887–909. https://doi.org/10.1002/cphy.c140053

Fang, Q., Zhao, X., Li, S., Qiu, Z., Wang, Z., & Geng, Q. (2022). Effect of Surfactants with Different Hydrophilic–Lipophilic Balance on the Cohesive Force between Cyclopentane Hydrate Particles. *Journal of Marine Science and Engineering*, *10*(9), 1255. https://doi.org/10.3390/jmse10091255

Fardiyah, Q., Suprapto, N., Kurniawan, F., Ersam, T., Slamet, A., & Suyanta, N. (2020). Preliminary Phytochemical Screening and Fluorescence Characterization of Several Medicinal Plants Extract from East Java

UNIVERSITAS GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Indonesia. *IOP Conference Series Materials Science and Engineering*, *833*(1), 012008. https://doi.org/10.1088/1757-899x/833/1/012008

Frei, G., Haimhoffer, Á., Csapó, E., Bodnár, K., Vasvári, G., Nemes, D., Lekli, I., Gyöngyösi, A., Bácskay, I., Fehér, P., & Józsa, L. (2023). In Vitro and In Vivo Efficacy of Topical Dosage Forms Containing Self-Nanoemulsifying Drug Delivery System Loaded with Curcumin. *Pharmaceutics*, *15*(8), 2054. https://doi.org/10.3390/pharmaceutics15082054

Fu, C., Qi, Z., Zhao, C., Kong, W., Li, H., Guo, W., & Yang, X. (2021). Enhanced wound repair ability of arginine-chitosan nanocomposite membrane through the antimicrobial peptides-loaded polydopamine-modified graphene oxide. *Journal of Biological Engineering*, *15*(1). https://doi.org/10.1186/s13036-021-00268-3

Goulding, V. (2014). *The effects of diabetes on collagen within wound healing* (18th ed., Vol. 2).

Hamosh, A. (2004). Online Mendelian Inheritance in Man (OMIM), a knowledgebase of human genes and genetic disorders. *Nucleic Acids Research*, *33*(Database issue), D514–D517. https://doi.org/10.1093/nar/gki033

Handayani, L. T. (2016). STUDI META ANALISIS PERAWATAN LUKA KAKI DIABETES DENGAN MODERN DRESSING. *The Indonesian Journal of Health Science*, *6*(2). https://doi.org/10.32528/the.v6i2.133

UNIVERSITAS GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Hariono, M., Yuliani, S. H., Istyastono, E. P., Riswanto, F. D., & Adhipandito, C. F. (2018). Matrix metalloproteinase 9 (MMP9) in wound healing of diabetic foot ulcer: Molecular target and structure-based drug design. *Wound Medicine*, *22*, 1–13. https://doi.org/10.1016/j.wndm.2018.05.003

Heald, A. H., Stedman, M., Davies, M., Livingston, M., Alshames, R., Lunt, M., Rayman, G., & Gadsby, R. (2020). Estimating life years lost to diabetes: outcomes from analysis of National Diabetes Audit and Office of National Statistics data. *Cardiovascular Endocrinology & Metabolism*, *9*(4), 183–185. https://doi.org/10.1097/xce.0000000000000210

Huh, Y. H., Ryu, J., & Chun, J. (2007). Regulation of type II collagen expression by Histone deacetylase in articular chondrocytes. *Journal of Biological Chemistry*, *282*(23), 17123–17131. https://doi.org/10.1074/jbc.m700599200

International Diabetes Federation (IDF). (2025, May 5). *IDF Diabetes Atlas | Global Diabetes Data & Statistics*. Diabetes Atlas. https://www.diabetesatlas.org/

Izham, M. N. M., Hussin, Y., Aziz, M. N. M., Yeap, S. K., Rahman, H. S., Masarudin, M. J., Mohamad, N. E., Abdullah, R., & Alitheen, N. B. (2019). Preparation and Characterization of Self Nano-Emulsifying Drug Delivery System Loaded with Citraland Its Antiproliferative Effect on Colorectal Cells In Vitro. *Nanomaterials*, *9*(7), 1028. https://doi.org/10.3390/nano9071028

Kim, Y. U., Gi, H., Jeong, E. K., Han, S., Seo, W., Kim, Y. J., Lee, S. B., & Kim, K. (2024). Development of a highly effective recombinant protein from human

UNIVERSITAS GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

collagen type III Alpha 1 (COL3A1) to enhance human skin cell functionality. *BMB Reports*, *57*(9), 424–429. https://doi.org/10.5483/bmbrep.2024-0107

Laksmitawati, D. R., Widyastuti, A., Karami, N., Afifah, E., Rihibiha, D. D., Nufus, H., & Widowati, W. (2017). Anti-inflammatory effects of Anredera cordifolia and Piper crocatum extracts on lipopolysaccharide-stimulated macrophage cell line. *Bangladesh Journal of Pharmacology*, *12*(1), 35. https://doi.org/10.3329/bjp.v12i1.28714

Lalatsa, A., Emeriewen, K., Protopsalti, V., Skelton, G., & Saleh, G. M. (2016). Developing transcutaneous nanoenabled anaesthetics for eyelid surgery. *British Journal of Ophthalmology*, *100*(6), 871–876. https://doi.org/10.1136/bjophthalmol-2015-308250

Lalatsa, A., Statts, L., De Jesus, J. A., Adewusi, O., Dea-Ayuela, M. A., Bolas-Fernandez, F., Laurenti, M. D., Passero, L. F. D., & Serrano, D. R. (2020). Topical buparvaquone nano-enabled hydrogels for cutaneous leishmaniasis. *International Journal of Pharmaceutics*, *588*, 119734. https://doi.org/10.1016/j.ijpharm.2020.119734

Li, H., Chen, X., Ren, K., Wu, L., Chen, G., & Xu, L. (2023). Qualitative study on diabetic cutaneous wound healing with radiation crosslinked bilayer collagen scaffold in rat model. *Scientific Reports*, *13*(1). https://doi.org/10.1038/s41598-023-33372-z

Li, H. X., Widowati, W., Azis, R., Yang, S. Y., Kim, Y. H., & Li, W. (2019). Chemical constituents of the Piper crocatum leaves and their

PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA
DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

chemotaxonomic significance. *Biochemical Systematics and Ecology*, *86*, 103905. https://doi.org/10.1016/j.bse.2019.05.013

Li, J., Cai, W., Shen, F., Feng, Z., Zhu, G., Cao, J., & Xu, B. (2014). Protease-activated receptor-2 modulates hepatic stellate cell collagen release and apoptotic status. *Archives of Biochemistry and Biophysics*, *545*, 162–166. https://doi.org/10.1016/j.abb.2014.01.027

Liza, P. (2021). Novel antimicrobial activities of self-nanoemulsifying drug delivery system (SNEDDS) ethyl acetate fraction from Garcinia mangostana L. peels against Staphylococcus epidermidis: Design, optimization, and in vitro studies. *Journal of Applied Pharmaceutical Science*. https://doi.org/10.7324/japs.2021.110313

Mahajan, R. K., Chawla, J., & Bakshi, M. S. (2004). Effects of monomeric and polymeric glycol additives on micellar properties of Tween non-ionic surfactants as studied by cyclic voltammetry. *Colloids and Surfaces a Physicochemical and Engineering Aspects*, *237*(1–3), 119–124. https://doi.org/10.1016/j.colsurfa.2004.02.013

Maslikah, S. I., Lestari, S. R., Handayani, N., Putra, W. E., Alimah, A. R. N., Amalia, A., Afifah, S., & Arifah, S. N. (2023). The Anti-Inflammatory Potential of Red Betel (Piper crocatum) Leaves Through Inhibitory Mechanism on Nfκb Signaling Pathway: Drug-Like Candidate Study. *Natural and Life Sciences Communications*, *22*(1). https://doi.org/10.12982/nlsc.2023.005

UNIVERSITAS
GADJAH MADA
**PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Mathew-Steiner, S. S., Roy, S., & Sen, C. K. (2021). Collagen in wound healing. *Bioengineering*, *8*(5), 63. https://doi.org/10.3390/bioengineering8050063

Maulidya, V., Hasanah, A. N., Rijai, L., & Muchtaridi, M. (2023). Quality Control and Authentication of Black Betel Leaf Extract (Piper acre Blume) from East Kalimantan as an Antimicrobial Agent Using a Combination of High-Performance Liquid Chromatography and Chemometric Fourier Transform Infrared. *Molecules*, *28*(15), 5666. https://doi.org/10.3390/molecules28155666

Meirinho, S., Rodrigues, M., Santos, A. O., Falcão, A., & Alves, G. (2022). Self-Emulsifying Drug Delivery Systems: An Alternative Approach to Improve Brain Bioavailability of Poorly Water-Soluble Drugs through Intranasal Administration. *Pharmaceutics*, *14*(7), 1487. https://doi.org/10.3390/pharmaceutics14071487

Morakul, B., Teeranachaideekul, V., Limwikrant, W., & Junyaprasert, V. B. (2024). Dissolution and antioxidant potential of apigenin self nanoemulsifying drug delivery system (SNEDDS) for oral delivery. *Scientific Reports*, *14*(1). https://doi.org/10.1038/s41598-024-59617-z

Mukubwa, G. K., Nkanga, C. I., Buya, A. B., Mbinze, J. K., Krause, R. W., & Memvanga, P. B. (2020). Self-nanoemulsifying drug delivery systems (SNEDDS) for oral delivery of Garcinia kola seeds ethanolic extract: formulation and in vivo antimalarial activity. *Journal of Pharmacy &*

UNIVERSITAS GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Pharmacognosy Research, *8*(1), 177–190. https://doi.org/10.56499/jppres19.674_8.3.177

Nasi, L. S., Kairupan, C. F., & Lintong, P. M. (2015). EFEK DAUN SIRIH MERAH (Piper crocatum) TERHADAP KADAR GULA DARAH DAN GAMBARAN MORFOLOGI ENDOKRIN PANKREAS TIKUS WISTAR (Rattus norvegicus). *Jurnal e-Biomedik*, *3*(3). https://doi.org/10.35790/ebm.3.3.2015.10151

Nasr, A., Gardouh, A., & Ghorab, M. (2016). Novel Solid Self-Nanoemulsifying Drug Delivery System (S-SNEDDS) for oral delivery of Olmesartan medoxomil: design, formulation, pharmacokinetic and bioavailability evaluation. *Pharmaceutics*, *8*(3), 20. https://doi.org/10.3390/pharmaceutics8030020

Ngamkhae, N., Monthakantirat, O., Chulikhit, Y., Boonyarat, C., Maneenet, J., Khamphukdee, C., Kwankhao, P., Pitiporn, S., & Daodee, S. (2022). Optimization of extraction method for Kleeb Bua Daeng formula and comparison between ultrasound-assisted and microwave-assisted extraction. *Journal of Applied Research on Medicinal and Aromatic Plants*, *28*, 100369. https://doi.org/10.1016/j.jarmap.2022.100369

Nikam, P., Jain, A., Solanki, D., & Aher, S. (2024). REVOLUTIONIZING PHARMACEUTICALS: a DEEP DIVE INTO SELF NANO EMULSIFYING DRUG DELIVERY SYSTEMS. *International Journal of*

UNIVERSITAS GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA
DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Current Pharmaceutical Research, 1–9. https://doi.org/10.22159/ijcpr.2024v16i1.4019

Nuari, Y. R., Abusri, M., Yuntari, W., Tryadi, O. M., & Ardhiana, F. M. (2024). Effects of Piper crocatum leaf extract-based ointments on bacteria associated with diabetic ulcers: an in vitro study. *Pharmaciana*, *14*(2), 209. https://doi.org/10.12928/pharmaciana.v14i2.28653

Nugroho, B. H., & Sari, N. P. (2018). Fomulasi self nano emulsifiying drug delivery system (SNEDDS) ekstrak daun karamunting (Rhodomyrtus tomentosa (Ait.) Hassk). *Jurnal Ilmiah Farmasi*, *14*(1), 1–8. https://doi.org/10.20885/jif.vol14.iss1.art01

Nurinsani, E. Y. Y., Andrianto, D., & Safithri, M. (2024a). Acetylcholinesterase inhibition activity and phytochemical screening of red betel leaf (Piper crocatum Ruiz & Pav) as anti-dementia agents. *BIO Web of Conferences*, *123*, 02009. https://doi.org/10.1051/bioconf/202412302009

Nurinsani, E. Y. Y., Andrianto, D., & Safithri, M. (2024b). Acetylcholinesterase inhibition activity and phytochemical screening of red betel leaf (Piper crocatum Ruiz & Pav) as anti-dementia agents. *BIO Web of Conferences*, *123*, 02009. https://doi.org/10.1051/bioconf/202412302009

Othman, H., Bakar, N. A., Rajab, N., Budin, S., Shamsuddin, A., & Nor, N. M. (2019). Primary skin irritation and dermal sensitization assay: In vivo evaluation of the essential oil from Piper sarmentosum Roxb. *Pharmacognosy Magazine*, *15*(64), 352. https://doi.org/10.4103/pm.pm_635_18

UNIVERSITAS
GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Packer, C. F., Ali, S. A., & Manna, B. (2023, July 17). *Diabetic foot ulcer*. StatPearls - NCBI Bookshelf. https://www.ncbi.nlm.nih.gov/books/NBK499887/

Page-McCaw, A., Ewald, A. J., & Werb, Z. (2007). Matrix metalloproteinases and the regulation of tissue remodelling. *Nature Reviews Molecular Cell Biology*, *8*(3), 221–233. https://doi.org/10.1038/nrm2125

Parfati, N., & Windono, T. (2017). Sirih Merah (Piper crocatum Ruiz & Pav.) Kajian Pustaka Aspek Botani, Kandungan Kimia, dan Aktivitas Farmakologi. *MPI (Media Pharmaceutica Indonesiana)*, *1*(2), 106–115. https://doi.org/10.24123/mpi.v1i2.193

Patel, S., Srivastava, S., Singh, M. R., & Singh, D. (2019). Mechanistic insight into diabetic wounds: Pathogenesis, molecular targets and treatment strategies to pace wound healing. *Biomedicine & Pharmacotherapy*, *112*, 108615. https://doi.org/10.1016/j.biopha.2019.108615

Piñero, J., Queralt-Rosinach, N., Bravo, À., Deu-Pons, J., Bauer-Mehren, A., Baron, M., Sanz, F., & Furlong, L. I. (2015). DisGeNET: a discovery platform for the dynamical exploration of human diseases and their genes. *Database*, *2015*(0), bav028. https://doi.org/10.1093/database/bav028

Piñero, J., Ramírez-Anguita, J. M., Saüch-Pitarch, J., Ronzano, F., Centeno, E., Sanz, F., & Furlong, L. I. (2019). The DisGeNET knowledge platform for disease genomics: 2019 update. *Nucleic Acids Research*. https://doi.org/10.1093/nar/gkz1021

PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA
DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Piper crocatum Ruiz & Pav. | *COL*. (2025). Retrieved May 8, 2025, from https://www.catalogueoflife.org/data/taxon/4J3RT

Rahayu, H. S. E., Nasruddin, N., Nurani, L. H., Darmawati, S., Rohmani, A., Lutfiyati, H., Wahyuningtyas, E. S., Sikumbang, I. M., Muhlisin, Z., Sukeksi, A., Nuroini, F., Ishijima, T., Sugama, J., & Nakatani, T. (2019). Ethanolic extract of the natural product of Daun sirih (Piper betle) leaves may impede the effectiveness of the plasma jet contact style for acute wounds. *Clinical Plasma Medicine*, *15*, 100090. https://doi.org/10.1016/j.cpme.2019.100090

Rajpoot, K., Tekade, M., Pandey, V., Nagaraja, S., Youngren-Ortiz, S. R., & Tekade, R. K. (2019). Self-microemulsifying drug-delivery system: ongoing challenges and future ahead. In *Elsevier eBooks* (pp. 393–454). https://doi.org/10.1016/b978-0-12-814487-9.00009-0

Rivaldo, R. M., & Chandra, P. (2024). Potential target and mechanism exploration from α-mangostin against triple-negative breast cancer: An in silico study. *Journal of Advanced Pharmaceutical Technology Amp Research*, *15*(3), 177–184. https://doi.org/10.4103/japtr.japtr_49_24

Sakthivel, R., Lin, L., Duann, Y., Chen, H., Su, C., Liu, X., He, J., & Chung, R. (2022). MOF-Derived CU-BTC Nanowire-Embedded 2D leaf-like structured ZIF Composite-Based ApTamer sensors for Real-Time in vivo insulin monitoring. *ACS Applied Materials & Interfaces*, *14*(25), 28639–28650. https://doi.org/10.1021/acsami.2c06785

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GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Salawi, A. (2022). Self-emulsifying drug delivery systems: a novel approach to deliver drugs. *Drug Delivery*, *29*(1), 1811–1823. https://doi.org/10.1080/10717544.2022.2083724

Sarojini, H., Billeter, A. T., Eichenberger, S., Druen, D., Barnett, R., Gardner, S. A., Galbraith, N. J., Polk, H. C., & Chien, S. (2017). Rapid tissue regeneration induced by intracellular ATP delivery—A preliminary mechanistic study. *PLoS ONE*, *12*(4), e0174899. https://doi.org/10.1371/journal.pone.0174899

Setyawati, A., Wahyuningsih, M. S. H., Nugrahaningsih, D. a. A., Effendy, C., Fneish, F., & Fortwengel, G. (2021). Piper crocatum Ruiz & Pav. ameliorates wound healing through p53, E-cadherin and SOD1 pathways on wounded hyperglycemia fibroblasts. *Saudi Journal of Biological Sciences*, *28*(12), 7257–7268. https://doi.org/10.1016/j.sjbs.2021.08.039

Shakeel, F., Shazly, G. A., Raish, M., Ahmad, A., Kalam, M. A., Ali, N., Ansari, M. A., & Elosaily, G. M. (2015). Biological investigation of a supersaturated self-nanoemulsifying drug delivery system of Piper cubeba essential oil. *RSC Advances*, *5*(127), 105206–105217. https://doi.org/10.1039/c5ra22900f

Stelzer, G., Rosen, N., Plaschkes, I., Zimmerman, S., Twik, M., Fishilevich, S., Stein, T. I., Nudel, R., Lieder, I., Mazor, Y., Kaplan, S., Dahary, D., Warshawsky, D., Guan-Golan, Y., Kohn, A., Rappaport, N., Safran, M., & Lancet, D. (2016). The GeneCards suite: from gene data mining to disease genome sequence analyses. *Current Protocols in Bioinformatics*, *54*(1). https://doi.org/10.1002/cpbi.5

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Strausberg, R. L., Feingold, E. A., Grouse, L. H., Derge, J. G., Klausner, R. D., Collins, F. S., Wagner, L., Shenmen, C. M., Schuler, G. D., Altschul, S. F., Zeeberg, B., Buetow, K. H., Schaefer, C. F., Bhat, N. K., Hopkins, R. F., Jordan, H., Moore, T., Max, S. I., Wang, J., . . . Marra, M. A. (2002). Generation and initial analysis of more than 15,000 full-length human and mouse cDNA sequences. *Proceedings of the National Academy of Sciences*, *99*(26), 16899–16903. https://doi.org/10.1073/pnas.242603899

Szklarczyk, D., Gable, A. L., Lyon, D., Junge, A., Wyder, S., Huerta-Cepas, J., Simonovic, M., Doncheva, N. T., Morris, J. H., Bork, P., Jensen, L. J., & Von Mering, C. (2018). STRING v11: protein–protein association networks with increased coverage, supporting functional discovery in genome-wide experimental datasets. *Nucleic Acids Research*, *47*(D1), D607–D613. https://doi.org/10.1093/nar/gky1131

Tan, N. S., Michalik, L., Noy, N., Yasmin, R., Pacot, C., Heim, M., Flühmann, B., Desvergne, B., & Wahli, W. (2001). Critical roles of PPARβ/δ in keratinocyte response to inflammation. *Genes & Development*, *15*(24), 3263–3277. https://doi.org/10.1101/gad.207501

Van Putte, L., De Schrijver, S., & Moortgat, P. (2016). The effects of advanced glycation end products (AGEs) on dermal wound healing and scar formation: a systematic review. *Scars Burns & Healing*, *2*. https://doi.org/10.1177/2059513116676828

UNIVERSITAS
GADJAH MADA
PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Van Staden, D., Du Plessis, J., & Viljoen, J. (2020). Development of Topical/Transdermal Self-Emulsifying drug delivery systems, not as simple as expected. *Scientia Pharmaceutica*, *88*(2), 17. https://doi.org/10.3390/scipharm88020017

Xiong, G., Stewart, R. L., Chen, J., Gao, T., Scott, T. L., Samayoa, L. M., O'Connor, K., Lane, A. N., & Xu, R. (2018). Collagen prolyl 4-hydroxylase 1 is essential for HIF-1α stabilization and TNBC chemoresistance. *Nature Communications*, *9*(1). https://doi.org/10.1038/s41467-018-06893-9

Xu, X., Chen, Z., Wang, Y., Yamada, Y., & Steffensen, B. (2005). Functional basis for the overlap in ligand interactions and substrate specificities of matrix metalloproteinases-9 and -2. *Biochemical Journal*, *392*(1), 127–134. https://doi.org/10.1042/bj20050650

Xu, X., Wang, Y., Lauer-Fields, J. L., Fields, G. B., & Steffensen, B. (2004). Contributions of the MMP-2 collagen binding domain to gelatin cleavage. *Matrix Biology*, *23*(3), 171–181. https://doi.org/10.1016/j.matbio.2004.05.002

Yang, H., Li, J., Liu, S., Yang, X., & Liu, J. (2022). Predicting risk of hypoglycemia in patients with Type 2 diabetes by Electronic Health Record–Based Machine Learning: Development and Validation. *JMIR Medical Informatics*, *10*(6), e36958. https://doi.org/10.2196/36958

Zhang, J., Zhou, R., Deng, L., Cao, G., Zhang, Y., Xu, H., Hou, J., Ju, S., & Yang, H. (2022). Huangbai liniment and berberine promoted wound healing in high-

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PENGARUH SNEDDS EKSTRAK DAUN Piper crocatum TERHADAP DEPOSISI KOLAGEN DALAM KESEMBUHAN LUKA DIABETES: ANALISIS NETWORK PHARMACOLOGY DAN STUDI IN VIVO
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

fat diet/Streptozotocin-induced diabetic rats. *Biomedicine & Pharmacotherapy*, *150*, 112948. https://doi.org/10.1016/j.biopha.2022.112948

Zheng, A., Xu, X., Xiao, H., Li, N., Guan, Y., & Li, S. (2012). Antistatic modification of polypropylene by incorporating Tween/modified Tween. *Applied Surface Science*, *258*(22), 8861–8866. https://doi.org/10.1016/j.apsusc.2012.05.105

Zhou, Y., Zhou, B., Pache, L., Chang, M., Khodabakhshi, A. H., Tanaseichuk, O., Benner, C., & Chanda, S. K. (2019). Metascape provides a biologist-oriented resource for the analysis of systems-level datasets. *Nature Communications*, *10*(1). https://doi.org/10.1038/s41467-019-09234-6