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DAFTAR PUSTAKA

Abd, L. M., Wahab, E., Essa, E. A., El, G. M., & Mona, M. (2023). The Development and Evaluation of Phase Transition Microemulsion for Ocular Delivery of Acetazolamide for Glaucoma Treatment. *AAPS PharmSciTech*, 1–13. https://doi.org/10.1208/s12249-022-02459-7

Ahmad, A. (2022). Visualizing Chlorophyll a Fluorescence : A Practical Demonstration. *REIDOCREA, 11*(63), 713–718.

Ait-touchente, Z., Zine, N., Jaffrezic-renault, N., Errachid, A., Lebaz, N., Fessi, H., & Elaissari, A. (2023). Exploring the Versatility of Microemulsions in Cutaneous Drug Delivery: Opportunities and Challenges. *Nanomaterials*, *13*(1688), 1–19. https://doi.org/https://doi.org/10.3390/ nano13101688

Al-Barghouthy, E. Y., Hamed, S., Mehyar, G. F., & AlKhatib, H. S. (2025). Comparative Evaluation of Spreadability Measurement Methods for Topical Semisolid Formulations/A Scoping Review. *Gels*, *11*(1006), 1–22. https://doi.org/https://doi.org/10.3390/ gels11121006

Alam, N., & Bristi, N. J. (2013). Review on in vivo and in vitro methods evaluation of antioxidant activity. *Saudi Pharmaceutical Journal*, *21*(2), 143–152. https://doi.org/10.1016/j.jsps.2012.05.002

Algahtani, M. S., Ahmad, M. Z., & Ahmad, J. (2022). Investigation of Factors Influencing Formation of Nanoemulsion by Spontaneous Emulsification: Impact on Droplet Size, Polydispersity Index, and Stability. *Bioengineering*, *9*(384), 1–17. https://doi.org/https://doi.org/10.3390/ bioengineering9080384

Allen, L. V. (2009). *Handbook of Pharmaceutical Excipients* (M. E. Rowe, Raymond C., Sheskey, Paul J., Quinn (ed.); 6 ed.). Pharmaceutical Press and American Pharmacists Association.

Amara, A. A. A. F., El-masry, M. H., Salem, G. A., & Baghdadi, H. H. (2024). Silica Gel Chromatographic Methods for Identification , Isolation and Purification of Gossypol Acetic Acid. *Gels*, *10*(432), 1–14. https://doi.org/https://doi.org/ 10.3390/gels10070432

Andini, N. S. (2024). *Analisis Tren Penjualan Beauty Care pada Kategori Paket Kecantikan Periode Q1 2024*. Compas. https://compas.co.id/article/tren-penjualan-paket-kecantikan-periode-q1-2024/

Assalam, S., Gozali, T., Ikrawan, Y., & Nurfalia, I. (2023). Optimalisasi Formula Minuman Olahan Jeruk Nipis (Citrus aurantifolia) Dengan Parameter Karekteristik Produk. *Jurnal Penelitian Pertanian Terapan*, *23*(2), 288–301. http://dx.doi.org/10.25181/jppt.v23i2.2923

Ayu Bainunniza, Reslely Harjanti, A. N. (2024). Formulasi Serum Antioksidan Ekstrak Etanol Daun Matoa (Pometia pinnata J. R Frost and G. Frost) Dengan Variasi Gelling Agent Carbopol 940. *Intan Husada: Jurnal Ilmiah Keperawatan*, *12*(2), 258–270. https://doi.org/10.52236/ih.v12i2.608

Banjarnahor, S. D. S., & Artanti, N. (2014). Antioxidant properties of flavonoids. *Med J Indones*, *23*(4), 239–244.

Bau, U., Mangani, F., Roccon, A., & Soldati, A. (2025). Transfer Dynamics of Hydrophilic and Lipophilic Surfactants in Turbulent Oil−Water Emulsions. *Langmuir*, *41*(28), 18488–18500.

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
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https://doi.org/10.1021/acs.langmuir.5c01250

Blois, M. S. (1958). Antioxidant determinations by the use of a stable free radical. *Nature*, *181*(4617), 1199–1200. https://doi.org/https://doi.org/10.1038/1811199a0

BPOM. (2023). *Pedoman Penyiapan Bahan Baku Obat Bahan Alam. Berbasis Ekstrak/Fraksi* (Nomor November). BPOM RI.

BPOM RI. (2023). *Peraturan Badan Pengawas Obat dan Makanan Nomor 29 Tahun 2023 tentang Persyaratan Keamanan dan Mutu Obat Bahan Alam* (Nomor 888).

Brand-Williams, W., Cuvelier, M. E., & Berset, C. (1995). Use of a Free Radical Method to Evaluate Antioxidant Activity. *Lebensm.-Wiss. u.-Technol*, *28*, 25–30.

Cano, A., Maestre, A. B., Hernández-Ruiz, J., & Arnao, M. B. (2023). ABTS/TAC Methodology: Main Milestones and Recent Applications. *Processes*, *11*(185). https://doi.org/10.3390/pr11010185

Carrer, V., Alonso, C., Pont, M., Zanuy, M., Córdoba, M., Espinosa, S., Barba, C., Oliver, M. A., Martí, M., & Coderch, L. (2019). Effect of propylene glycol on the skin penetration of drugs. *Archives of Dermatological Research*, *312*(5), 337–352. https://doi.org/10.1007/s00403-019-02017-5

Carsita, F. H., Zulkarnain, A. K., & Lukitaningsih, E. (2026). Optimization of Microemulsion Formulation Containing Purified Curculigo latifolia Leaf Extract Using D-Optimal Design with Enhanced In Vitro Antioxidant Activity. *Tropical Journal of Natural Product Research Available*, *10*(4), 8809–8817. https://doi.org/10.26538/tjnpr/v10i4.66

Célino, A., Fréour, S., Jacquemin, F., & Casari, P. (2014). The hygroscopic behavior of plant fibers: a review. *Frontiers in Chemistry*, *1*(43), 1–12. https://doi.org/10.3389/fchem.2013.00043

Chasanah, U., Sugihartini, N., & Yuliani, S. (2025). Formulation and Evaluation of Moringa Seed Oil Nanoemulsion Using Polyoxyl 40 Hydrogenated Castor Oil and Glycerin as a Surfactant- Cosurfactant System. *Indonesian Journal of Pharmacy*, *36*(4), 622–637.

Chatzidaki, M. D., Mitsou, E., Yaghmur, A., Xenakis, A., & Papadimitriou, V. (2015). Formulation and characterization of food-grade microemulsions as carriers of natural phenolic antioxidants. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, *483*, 130–136. https://doi.org/10.1016/j.colsurfa.2015.03.060

Christodoulou, M. C., Palacios, J. C. O., Hesami, G., Jafarzadeh, S., Lorenzo, J. M., Domínguez, R., Moreno, A., & Hadidi, M. (2022). Spectrophotometric Methods for Measurement of Antioxidant Activity in Food and Pharmaceuticals. *Antioxidants*, *11*(2213), 1–33. https://doi.org/https://doi.org/10.3390/antiox11112213

Cimino, C., Bonaccorso, A., Tomasello, B., Alberghina, G. A., Musumeci, T., Puglia, C., Pignatello, R., Marrazzo, A., & Carbone, C. (2024). W/O/W Microemulsions for Nasal Delivery of Hydrophilic Compounds: A Preliminary Study. *Journal of Pharmaceutical Sciences*, *113*(2024), 1636–1644. https://doi.org/10.1016/j.xphs.2024.01.013

UNIVERSITAS GADJAH MADA
**Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
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Danaei, M., Dehghankhold, M., Ataei, S., Davarani, F. H., Javanmard, R., Dokhani, A., Khorasani, S., & Id, M. R. M. (2018). Impact of Particle Size and Polydispersity Index on the Clinical Applications of Lipidic Nanocarrier Systems. *Pharmaceutics*, *10*(57), 1–17. https://doi.org/10.3390/pharmaceutics10020057

Dewi, S. N., Martien, R., Novitasari, L., & Nuringtyas, T. R. (2025). Formulation and Characterization Self-Nanoemulsifying Drug Delivery Systems (SNEDDS) Chloroform Extract of Agarwood Leaves (Gyrinops verstegii (Gilg.) Domke. *Jurnal Sains Farmasi & Klinis*, *11*(3), 179–188. https://doi.org/10.25077/jsfk.11.3.179-188.2024

Duangjit, S., Mehr, L. M., Kumpugdee-Vollrath, M., & Ngawhirunpat, T. (2014). Role of simplex lattice statistical design in the formulation and optimization of microemulsions for transdermal delivery. *Biological and Pharmaceutical Bulletin*, *37*(12), 1948–1957. https://doi.org/10.1248/bpb.b14-00549

Ebenazer, A., Franklyne, J. S., Mukherjee, A., & Chandrasekaran, N. (2018). DEVELOPMENT OF AZITHROMYCIN LOADED LEMONGRASS OIL BASED MICROEMULSION AND DETERMINATION OF ANTIBACTERIAL POTENTIAL. *International Journal of Applied Pharmaceutics*, *10*(6), 72–81.

Enzo Life Sciences. (2015). *Neutrophil Elastase Colorimetric Drug Discovery Kit*. http://www.enzolifesciences.com/BML-AK497/neutrophil-elastasecolorimetric-drugdiscovery-kit

Erika F. Costa, Wagner V. Magalhães, L. C. D. S. (2022). Recent Advances in Herbal-Derived Products with Skin Anti-Aging Properties and Cosmetic Applications. *Molecules*, *27*(7518), 1–29.

Fauziyah, R., Widyasanti, A., & Rosalinda, S. (2022). Perbedaan Metode Ekstraksi terhadap Kadar Sisa Pelarut dan Rendemen Total Ekstrak Bunga Telang (Clitoria ternatea L .). *Kimia Padjadjaran*, *1*, 18–25.

Feng, C., Chen, X., Yin, X., Jiang, Y., & Zhao, C. (2024). Matrix Metalloproteinases on Skin Photoaging. *Journal of Cosmetic Dermatology*, *23*, 3847–3862. https://doi.org/10.1111/jocd.16558

Fernenda, L., Putri, N., Serawaidi, A., & Gunawan, F. (2025). Formulasi dan Evaluasi Aktivitas Antioksidan Serum Ekstrak Bonggol Nanas (Ananas comosus (L.) Merr.). *Jurnal Ilmu Kesehatan Abdurrab*, *3*(4), 120–127.

Floegel, A., Kim, D., Chung, S., Koo, S. I., & Chun, O. K. (2011). Composition and Analysis Comparison of ABTS / DPPH assays to measure antioxidant capacity in popular antioxidant-rich US foods. *Journal of Food Composition and Analysis*, *24*(7), 1043–1048. https://doi.org/10.1016/j.jfca.2011.01.008

Fossati, A., Cavalloro, V., Rossi, D., Collina, S., & Martino, E. (2025). A practical and easy - to - scale protocol for removing chlorophylls from leaf extracts. *Applications in Plant in Sciences*, *13*(4), 1–11. https://doi.org/10.1002/aps3.70018

Gackowski, M., Froelich, A., Kordyl, O., Długaszewska, J., Kaminska, D., Schneider, R., & Osmałek, T. (2025). Formulation Studies on Microemulsion-Based Polymer Gels Loaded with Voriconazole for the Treatment of Skin Mycoses. *Pharmaceutics*, *17*(1218), 1–31.

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
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https://doi.org/10.3390/pharmaceutics17091218

Galvez-Martin, P., Soto-Fernandez, C., Romero-Rueda, J., Cabañas, J., Torrent, A., Castells, G., & Martinez-Puig, D. (2023). A Novel Hyaluronic Acid Matrix Ingredient with Regenerative, Anti-Aging and Antioxidant Capacity. *International Journal of Molecular Sciences*, *24*(5). https://doi.org/10.3390/ijms24054774

Govaerts, R. H. A. (2011). *World checklist of selected plant families database Curculigo latifolia*. Royal Botanic Gardens, Kew. https://powo.science.kew.org

Han, S., Hong, J., Luo, Q., Xu, H., Tan, H., Wang, Q., Tao, J., Zhou, Y., Peng, L., He, Y., Shi, J., Ma, N., Cheng, Y., & Su, H. (2021). Hygroscopicity of organic compounds as a function of organic functionality, water solubility, molecular weight and oxidation level. *Atmospheric Chemistry and Physics*, *22*, 3985–4004. https://doi.org/https://doi.org/10.5194/acp-2021-486

Hanifah, R., Sukmawati, & Amalia, N. (2023). UJI AKTIVITAS ANTIOKSIDAN SEDIAAN SERUM WAJAH EKSTRAK ETANOL DAUN KELOR (Moringa oleifera Lam.) DENGAN METODE DPPH. *Journal of Pharmacopolium*, *6*(2), 27–40. http://ejurnal.stikes-bth.ac.id/index.php/P3M_JoP

Haryanti, S., Budiarti, M., Farida, S., Dewi, A. P. K., Supriyanti, N., Jokopriyambodo, W., Wahyono, S., & Widowati, L. (2024). The palm oil-based chlorophyll removal and the evaluation of antiaging properties on Centella asiatica ethanolic extract. *IOP Conference Series: Earth and Environmental Science*, *1312*, 012041. https://doi.org/10.1088/1755-1315/1312/1/012041

Hidayat, I. R., Zuhrotun, A., & Sopyan, I. (2020). Design-Expert Software sebagai Alat Optimasi Formulasi Sediaan Farmasi. *Majalah Farmasetika*, *6*(1), 99–120. https://doi.org/10.24198/mfarmasetika.v6i1.27842

Husni, E., Ismed, F., & Afriyandi, D. (2020). Standardization Study of Simplicia and Extract of Calamondin (Citrus microcarpa Bunge) Peel , Quantification of Hesperidin and Antibacterial Assay. *Pharmacognosy Journal*, *12*(4), 777–783.

Husni, E., Ismed, F., & Awaliana. (2021). Standardization Extracts and Simplicia of Limau Sundai Peel (Citrus x aurantiifolia 'sundai'), Determine Content of Nobiletin and Antibacterial Activity Test. *Pharmacognosy Journal*, *13*(6), 1323–1331.

Hwang, J., Lee, S., Lee, H. G., Choi, D., & Lim, K.-M. (2022). Evaluation of Skin Irritation of Acids Commonly Used in Cleaners in 3D-Reconstructed Human Epidermis Model, KeraSkinTM. *Toxics*, *10*(558), 1–12. https://doi.org/https://doi.org/ 10.3390/toxics10100558

Ilhami Gulcin, & Alwasel, S. H. (2023). DPPH Radical Scavenging Assay. *Processes*, *11*(2248), 1–20. https://doi.org/10.3390/pr11082248

Indradi, R. B., Susilawati, Y., Ramadhania, Z. M., Savitri, A., Soleh, S., Zuhrotun, A., & Iskandar, Y. (2022). PHARMACOGNOSTIC CHARACTERISTIC OF KAEMPFERIA GALANGA RHIZOME DRIED BY OVEN AND COMBINATION METHODS. *International Journal of Applied*

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Pharmaceutics, *14*(4), 155–158. https://doi.org/https://dx.doi.org/10.22159/ijap.2022.v14s4.PP38

Jang, H., Shin, C. Y., & Kim, K. (2015). Safety Evaluation of Polyethylene Glycol (PEG) Compounds for Cosmetic Use. *Toxicological Research*, *31*(2), 105–136.

Jayani, N. I. E., Jaya, I. G. N. S., Martins, M. P. P., & Rani, K. C. (2025). Thin Layer Chromatography (TLC) Fingerprint Analysis of Moringa oleifera Leaves Extract. *Media Pharmaceutica Indonesiana*, *7*(2), 148–157. https://doi.org/10.24123/mpi.v7i2.7441

Jeremiah, C., Katsayal, U. A., Nuhu, A., Anafi, S. B., & Ibrahim, M. A. (2019). Phytochemical Screening and Anti-Inflammatory Studies of Tapinanthus globiferus (A . Rich) Teigh . Leaves Three Extracts. *Pharmaceutical Sciences*, *25*(2), 124–131. https://doi.org/10.15171/PS.2019.19

Joshi, T., & Sharma, P. R. D. and P. K. (2024). Chromatographic Analysis of Bioactive Metabolites from a Traditional Food Combination of (Semi) Arid Regions—Panchkuta: Insights for Sustainable Functional Foods Development. *biology and life sciences forum*, *38*(5), 1–12. https://doi.org/ 10.3390/blsf2024038005

Jufri, M., Iswandana, R., Wardani, D. A., & Malik, S. F. (2022). FORMULATION OF RED FRUIT OIL NANOEMULSION USING SUCROSE PALMITATE. *International Journal of Applied Pharmaceutics*, *14*(5), 175–180. https://doi.org/https://dx.doi.org/10.22159/ijap.2022v14i5.44314

Kaithwar, K., Soni, P. K., Soni, R., & Paswan, S. K. (2026). D-OPTIMAL MIXTURE DESIGN ASSISTED FORMULATION OPTIMIZATION OF DESONIDE- LOADED EMULGEL FOR TOPICAL APPLICATION. *International Journal of Applied Pharmaceutics*, *18*(1), 526–541. https://dx.doi.org/10.22159/ijap.2026v18i1.56510

Kemenkes RI. (2017). *Farmakope Herbal Indonesia Edisi II*. Kementerian Kesehatan Republik Indonesia.

Kemenkes RI. (2022). Suplemen I Farmakope Herbal Indonesia Edisi II. In *Kementerian Kesehatan Republik Indonesia*. Kementerian Kesehatan Republik Indonesia.

Kementerian Perindustrian RI. (2024). *Peraturan Menteri Perindustrian Nomor 32 Tahun 2024 tentang Klasifikasi Komoditas Turunan Kelapa Sawit*.

Khafi, M., Hertiani, T., Murwanti, R., Irawan, M. B., Marzuki, A., & Salim, R. D. (2025). Formulation and Stability Test of HPMC and Carbomer 940 based-Gel Formulation Containing Plantago major L. hydroalcoholic extract. *Majalah Farmaseutik*, *21*(2), 198–203. https://doi.org/10.22146/farmaseutik.v21i2.95893

Khan, A. W., Kotta, S., Ansari, S. H., Sharma, R. K., & Ali, J. (2015). Self-nanoemulsifying drug delivery system (SNEDDS) of the poorly water-soluble grapefruit flavonoid Naringenin: design, characterization, in vitro and in vivo evaluation. *Drug Delivery*, *22*(4), 552–561. https://doi.org/10.3109/10717544.2013.878003

Kim, S. B., Bisson, J., Friesen, J. B., Pauli, G. F., & Simmler, C. (2021). Selective Chlorophyll Removal Method to “Degreen” Botanical Extracts. *J Nat Prod.*,

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
Sebagai Antioksidan dan Anti-Elastase Secara In Vitro
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

83(6), 1846–1858. https://doi.org/10.1021/acs.jnatprod.0c00005.Selective

Kiromah, N. Z. W., Sugihartini, N., & Nurani, L. H. (2023). Development and characterization of clove oil microemulsion. *Pharmacia*, *70*(1), 233–241. https://doi.org/10.3897/pharmacia.70.e98096

Kowalska, T., & Sajewicz, M. (2022). Thin-Layer Chromatography (TLC) in the Screening of Botanicals–Its Versatile Potential and Selected ApplicationsThin-Layer Chromatography (TLC) in the Screening of Botanicals–Its Versatile Potential and Selected Applications. *Molecules*, *27*(6607), 1–23. https://doi.org/https://doi.org/10.3390/molecules27196607

Lee, S. H., Chow, P. S., & Yagnik, C. K. (2022). Developing Eco-Friendly Skin Care Formulations with Microemulsions of Essential Oil. *Cosmetics*, *9*(2). https://doi.org/10.3390/cosmetics9020030

Leng, K., Guan, B., Liu, W., Jiang, C., Cong, S., Peng, B., & Tao, Y. (2024). Advance of Microemulsion and Application for Enhanced Oil Recovery. *nanomaterials Review*, *14*(12), 1004.

Lim, S. H., & Ibrahim, D. (2012). Studies on antibiotic compounds of methanol extract of Curculigo latifolia dryand. *Proceedings of the 2nd Annual International Conference Syiah Kuala University 2012 & The 8th IMT-GT Uninet Biosciences Conference*, *2*(1), 383–385.

Lipinski, C. A., Lombardo, F., Dominy, B. W., & Feeney, P. J. (2012). Experimental and computational approaches to estimate solubility and permeability in drug discovery and development settings i. *Advanced Drug Delivery Reviews*, *64*, 4–17. https://doi.org/10.1016/j.addr.2012.09.019

Lohani, A., Verma, A., Hema, G., & Pathak, K. (2021). Topical Delivery of Geranium/Calendula Essential Oil-Entrapped Ethanolic Lipid Vesicular Cream to Combat Skin Aging. *BioMed Research International*, *2021*, 1–13. https://doi.org/https://doi.org/10.1155/2021/4593759 Research

Lopes, L. B. (2014). Overcoming the Cutaneous Barrier with Microemulsions. *Pharmaceutics*, *6*(1), 52–77. https://doi.org/10.3390/pharmaceutics6010052

Ložien, K., & Chochlovait˙, I. (2025). Effect of Phenological Stage and Leaf Age on Changes of Chlorophyll and Carotenoid Contents in Some Weeds and Invasive Species. *Molecules*, *30*(3788), 1–12. https://doi.org/https://doi.org/10.3390/molecules30183788

Lv, Y., Ye, Z., Luo, S., Xiong, Y., Liu, Y., & Zhang, Z. (2024). Removal strategies for the undesirable components from the crude vegetable oils: A review. *Journal of Cleaner Production*, *478*(143983), 1–22. https://doi.org/10.1016/j.jclepro.2024.143983

Mankar, S., & Vaidya, S. (2024). Review on Face Serum. *Asian Journal of Pharmaceutics*, *18*(3), 740–749.

Mao, Y., Hao, T., Zhang, H., Gu, X., Wang, J., Shi, F., Chen, X., Guo, L., Gao, J., Shen, Y., Zhang, J., & Yu, S. (2024). Penetration Enhancer-Free Mixed Micelles for Improving Eprinomectin Transdermal c Efficiency in Animal Parasitic Infections Therapy. *International Journal of Nanomedicine*, *2024*(19), 11071–11085. https://doi.org/https://doi.org/10.2147/IJN.S476164

Mapile, A. N., & Scatena, L. F. (2024). Stabilizing strands: Exploring the kinetic stability of polymer-coated emulsions with surface specific spectroscopy.

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Colloids and Surfaces A: Physicochemical and Engineering Aspects, *697*, 134414. https://doi.org/10.1016/j.colsurfa.2024.134414

Marsup, P., Sirilun, S., Prommaban, A., Sriyab, S., Neimkhum, W., Sirithunyalug, J., Anuchapreeda, S., To-anun, C., & Chaiyana, W. (2021). Potential of topical microemulsion serum formulations to enhance and clinical antiskin wrinkle benefits of Cordyceps Militaris extracts. *Research Square*, 1–25. https://doi.org/https://doi.org/10.21203/rs.3.rs-550591/v1 License:

Maya, I., Sriwidodo, S., Mita, S. R., Kusumawulan, C. K., Putriana, N. A., Amalia, E., Aulia, R. N., Sofyan, H. N., Dzulfannazhir, F., & Nugraha, M. H. (2024). Formulation and Evaluation of Facial Serum Containing Sacha Inchi Oil (Plukenetia volubilis L.) from Indonesia as an Anti-Aging: Stability, In Vitro, and Skin Irritation Assessments. *Cosmetics*, *11*(6). https://doi.org/10.3390/cosmetics11060226

Miksusanti, Apriani, E. F., & Bihurinin, A. H. B. (2023). Optimization of Tween 80 and PEG-400 Concentration in Indonesian Virgin Coconut Oil Nanoemulsion as Antibacterial against Staphylococcus aureus. *Sains Malaysiana*, *52*(4), 1259–1272.

Milutinov, J., Krstonošic, V., Cirin, D., & Pavlovic, N. (2023). Emulgels: Promising Carrier Systems for Food Ingredients and Drugs. *polymers*, *15*(2302), 1–18. https://doi.org/https://doi.org/10.3390/ polym15102302

Minarti, M., Ariani, N., Megawati, M., Hidayat, A., Hendra, M., Primahana, G., & Darmawan, A. (2024). Potential Antioxidant Activity Methods DPPH, ABTS, FRAP, Total Phenol and Total Flavonoid Levels of Macaranga hypoleuca (Reichb. f. & Zoll.) Leaves Extract and Fractions. *E3S Web of Conferences*, *503*, 1–13. https://doi.org/10.1051/e3sconf/202450307005

Mistry, J., & Notman, R. (2024). Mechanisms of the Drug Penetration Enhancer Propylene Glycol Interacting with Skin Lipid Membranes. *Journal of Physical Chemistry B*, *128*(16), 3885–3897. https://doi.org/10.1021/acs.jpcb.3c06784

Molyneux P. (2004). The use of the stable free radical diphenylpicryl-hydrazyl (DPPH) for estimating anti-oxidant activity. *Songklanakarin Journal of Science and Technology*, *26*(May), 211–219.

Monti, A., Virgilio, N. Di, & Venturi, G. (2008). *Mineral composition and ash content of six major energy crops*. *32*, 216–223. https://doi.org/10.1016/j.biombioe.2007.09.012

Mota, F. A. R., Pereira, S. A. P., Araujo, A. R. T. S., & Saraiva, M. L. M. F. S. (2021). Evaluation of Ionic Liquids and Ionic Liquids Active Pharmaceutical Ingredients Inhibition in Elastase Enzyme Activity. *Molecules*, *26*(200). https://doi.org/10.3390/ molecules26010200

Mote, V., Pawar, R., & Jadge, D. (2025). Formulation and Evaluation of Microemulsion Systems: Advances, Mechanistic Insights, and Pharmaceutical Applications. *International Journal of Pharmaceutical Sciences*, *3*(11), 4067–4084. https://doi.org/10.5281/zenodo.17719556

Motene, M. V, & Maepa, C. (2025). Optimizing the Antimicrobial , Antioxidant , and Cytotoxic Properties of Silver Nanoparticles Synthesized from Elephantorrhiza elephantina (Burch .) Extracts : A Comprehensive Study. *Plants*, *14*(5), 822. https://doi.org/https://doi.org/10.3390/plants14050822

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
Sebagai Antioksidan dan Anti-Elastase Secara In Vitro
Fajar Hasmoro Carsita, Prof. Dr. apt. Abdul Karim Zulkarnain, M.Si.; Prof. Dr.rer.nat. apt. Endang Lukitaningsih, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Musakhanian, J., & Osborne, D. W. (2025). Understanding Microemulsions and Nanoemulsions in (Trans) Dermal Delivery. In *AAPS PharmSciTech* (Vol. 26, Nomor 1). Springer International Publishing. https://doi.org/10.1208/s12249-024-02997-2

Mutmainah, Nugroho, A. K., Hertiani, T., & Adhyatmika. (2025). Moringa oleifera Seed Oil Nanoemulsion Using Tween 80 and Polyethylene Glycol 400 : *Tropical Journal of Natural Product Research*, *9*(4), 1843–1852.

Nahdhia, N., Rijal, M. A. S., Hendradi, E., & Widodo, R. T. (2024). Application of the Simplex Lattice Design Method to Determine the Optimal Formula of Diclofenac Sodium Nanoemulsion. *Pharmacy and Pharmaceutical Sciences Journal*, *11*(2), 137–146. https://doi.org/10.20473/jfiki.v11i22024.137-146

Nakai, K., & Tsuruta, D. (2021). What are reactive oxygen species, free radicals, and oxidative stress in skin diseases? *International Journal of Molecular Sciences*, *22*(19). https://doi.org/10.3390/ijms221910799

Nasir, N. M., Shah, N. S. E., Zainal, N. Z., Kassim, N. K., Faudzi, S. M. M., & Hasan, H. (2021). *Combination of Molecular Networking and LC-MS/MS Profiling in Investigating the Interrelationships between the Antioxidant and Antimicrobial Properties of Curculigo latifolia*. *10*(1488), 1–18. https://doi.org/https://doi.org/10.3390/plants10081488

Navya, P., k, P., k, T., & D, P. (2021). Optimization Techniques in Designing Pharmaceutical Formulations. *Indian Journal of Applied Research*, *April 2021*, 38–40. https://doi.org/10.36106/ijar/5201374

NCBI. (2026). *PubChem*. U.S. National Library of Medicine. https://pubchem.ncbi.nlm.nih.gov/

Nirmala, A., Rahmawati, I., & Kuncahyo, I. (2023). Optimization of serum formula active fraction of moringa leaf extract (Moringa oleifera Lambk) as antibacterial against Staphylococcus aureus. *International journal of health sciences*, *7*(S1), 3072–3089. https://doi.org/10.53730/ijhs.v7ns1.14687

Nur, S., Angelina, A. A., Aswad, M., Yulianty, R., Burhan, A., & Nursamsiar. (2021). In vitro anti-aging activity of Muntingia calabura L. fruit extract and its fractions. *Journal of Pharmacy and Pharmacognosy Research*, *9*(4), 409–421. https://doi.org/10.56499/jppres20.979_9.4.409

Nur, S., Hanafi, M., Setiawan, H., & Elya, B. (2022). In vitro ultra violet (UV) protection of curculigo latifolia extract as a sunscreen candidate. *IOP Conference Series: Earth and Environmental Science*, *1116*(1). https://doi.org/10.1088/1755-1315/1116/1/012009

Nur, S., Hanafi, M., Setiawan, H., Nursamsiar, N., & Elya, B. (2023). Molecular Docking Simulation of Reported Phytochemical Compounds from Curculigo latifolia Extract on Target Proteins Related to Skin Antiaging. *Tropical Journal of Natural Product Research*, *7*(11), 5067–5080. https://doi.org/10.26538/tjnpr/v7i11.9

Nur, S., Rumiyati, & Lukitaningsih, E. (2017). Skrining Aktivitas Antioksidan, Antiaging dan Penghambatan Tyrosinase dari EKstrak Etanolik dan Etil Asetat Daging Buah dan Kulit Buah Langsat (Lansium domesticum Corr) Secara In Vitro. *Traditional Medicine Journal*, *22*(1), 63–72.

Nur, S., Setiawan, H., Hanafi, M., & Elya, B. (2023a). Pharmacognostical and

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
Sebagai Antioksidan dan Anti-Elastase Secara In Vitro
Fajar Hasmoro Carsita, Prof. Dr. apt. Abdul Karim Zulkarnain, M.Si.; Prof. Dr.rer.nat. apt. Endang Lukitaningsih, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Phytochemical Studies and Biological Activity of Curculigo latifolia Plant Organs for Natural Skin-Whitening Compound Candidate. *The Scientific World Journal*, *2023*, 1–15. https://doi.org/10.1155/2023/5785259

Nur, S., Setiawan, H., Hanafi, M., & Elya, B. (2023b). Phytochemical composition, antioxidant, in vitro and in silico studies of active compounds of Curculigo latifolia extracts as promising elastase inhibitor. *Saudi Journal of Biological Sciences*, *30*(8), 103716. https://doi.org/10.1016/j.sjbs.2023.103716

Ollong, A. R., Martien, R., Ariyadi, B., & Zuprizal. (2026). Development and Characterization of Self-Nanoemulsifying Drug Delivery System (SNEDDS) of Red Fruit Oil (Pandanus conoideus Lam.) for Nutraceutical Applications. *Tropical Journal of Natural Product Research*, *10*(4), 8601–8608. https://doi.org/10.26538/tjnpr/v10i4.41

Osik, N. A., Lukzen, N. N., Yanshole, V. V, & Tsentalovich, Y. P. (2024). Loss of Volatile Metabolites during Concentration of Metabolomic Extracts. *ACS Omega*, *9*, 24015–24024. https://doi.org/10.1021/acsomega.4c02439

Panzella, L., & Napolitano, A. (2022). Condensed Tannins, a Viable Solution To Meet the Need for Sustainable and E ff ective Multifunctionality in Food Packaging: Structure, Sources, and Properties. *Journal of Agricultural and Food Chemistry*, *70*, 751–758. https://doi.org/10.1021/acs.jafc.1c07229

Patil, V., Angadi, S., Devdhe, S., & Wakte, P. (2015). Recent progress in simultaneous estimation of rutin, quercetin and liquiritin in Cocculus hirsutus by HPTLC. *Research Journal of Pharmacognosy*, *2*(4), 49–55.

Pereira, D. T., Dourado, D., Freire, D. T., Porto, D. L., Aragão, C. F. S., Souza, M. L. De, Araujo, G. R. S. De, Costa, A. M., Oliveira, W. N., Sapin-minet, A., Alencar, É. N., & Egito, E. S. T. (2025). Quality by design optimization of microemulsions for topical delivery of Passiflora setacea seed oil. *Beilstein Journal of Nanotechnology*, *16*, 2116–2131. https://doi.org/10.3762/bjnano.16.146

Phaisan, S., Yusakul, G., Sakdamas, A., Taluengjit, N., Sakamoto, S., & Putalun, W. (2020). A green and effective method using oils to remove chlorophyll from Chromolaena odorata (L.) R.M. King & H. Rob. *Songklanakarin Journal of Science and Technology*, *42*(5), 1084–1090. https://doi.org/10.14456/sjst-psu.2020.141

Plaskova, A., & Mlcek, J. (2023). New insights of the application of water or ethanol-water plant extract rich in active compounds in food. *Frontiers in Nutrition*, *10*(1118761), 1–23. https://doi.org/10.3389/fnut.2023.1118761

Pongsumpun, P., Iwamoto, S., & Siripatrawan, U. (2020). Response surface methodology for optimization of cinnamon essential oil nanoemulsion with improved stability and antifungal activity. *Ultrasonics - Sonochemistry*, *60*, 104604. https://doi.org/10.1016/j.ultsonch.2019.05.021

Pratiwi, E. D., & Dewi, N. P. (2022). Screening of Phytochemical Secondary Metabolites of Muntingia Calabura: a Potential as Hepatoprotector. *Journal of Fundamental and Applied Pharmaceutical Science*, *2*(2), 59–65. https://doi.org/10.18196/jfaps.v2i2.12364

Pujiawati, Y., Khotijah, L., & Wiryawan, I. (2023). Screening of antioxidant activities and their bioavailability of tropical plants. *IOP Conference Series:*

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
Sebagai Antioksidan dan Anti-Elastase Secara In Vitro
Fajar Hasmoro Carsita, Prof. Dr. apt. Abdul Karim Zulkarnain, M.Si.; Prof. Dr.rer.nat. apt. Endang Lukitaningsih, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Earth and Environmental Science, *1182*(012083), 1–5. https://doi.org/10.1088/1755-1315/1182/1/012083

Raab, C., Do, T. T., & Keck, C. M. (2025). *nfluence of Ethanol as a Preservative in Topical Formulation on the Dermal Penetration Efficacy of Active Compounds in Healthy and Barrier-Disrupted Skin*. *17*(196), 1–18. https://doi.org/https://doi.org/10.3390/pharmaceutics17020196

Radha, Kumar, M., Puri, S., Pundir, A., Bangar, S. P., Changan, S., Choudhary, P., Parameswari, E., Alhariri, A., Samota, M. K., Damale, R. D., Singh, S., Berwal, M. K., Dhumal, S., Bhoite, A. G., Senapathy, M., Sharma, A., Bhushan, B., & Mekhemar, M. (2021). Evaluation of Nutritional, Phytochemical, and Mineral Composition of Selected Medicinal Plants for Therapeutic Uses from Cold Desert of Western Himalaya. *Plants*, *10*(1429), 1–16. https://doi.org/https://doi.org/10.3390/plants10071429

Ratih, H. (2024). Formulation and Physical Evaluation of Sleeping Mask Gel Preparation of Mahogany Leaf Extract (Swietenia Mahagoni (L.) Jacq) As Antioxidant. *Jurnal Kartika Kimia*, *7*(1), 89–94. https://doi.org/10.26874/jkk.v7i1.265

Riwanti, P., Izazih, F., & Amaliyah. (2020). Pengaruh Perbedaan Konsentrasi Etanol pada Kadar Flavonoid Total Ekstrak Etanol 50,70 dan 96% Sargassum polycystum dari Madura. *Journal of Pharmaceutical Care Anwar Medika*, *2*(2), 82–95.

Sabunge, A., Isa, I., Hasan, H., Papeo, D. R. P., & Ramadani, F. N. (2026). Analisis Kadar Antioksidan Pada Hasil Infusa Jahe Merah (Zingiber Officinale Var. Rubrum), Kombinasi Kunyit (Curcuma Longa) dan Sereh (Cymbopogon citratus). *Jamb. J. Chem.*, *8*(1), 20–33.

Sadsyam, S., Auliah, N., Uko, W. O. W. A., Basir, N., & Utari, A. U. (2023). Antioxidant Evaluation of Facial Toner Formulations Containing Ethyl Acetate Fraction from Garcinia Mangostana L. Fruit using ABTS 2,2'-Azinobis 3-ethyl benzothiazoline 6-sulphonic Acid Method. *Journal of Health Sciences and Medical Development*, *2*(02), 94–105. https://doi.org/10.56741/hesmed.v2i02.266

Sanap, D., & Ghuge, P. (2024). Microemulsions as a potential carrier for improved drug delivery. *Journal of Research in Pharmacy*, *28*(6), 2202–2214. https://doi.org/10.29228/jrp.895

Sarheed, O., Dibi, M., & Ramesh, K. V. R. N. S. (2020). Studies on the Effect of Oil and Surfactant on the Formation of Alginate-Based O/W Lidocaine Nanocarriers Using Nanoemulsion Template. *Pharmaceutics*, *12*(1223), 1–21. https://doi.org/10.3390/pharmaceutics12121223

Sari, P. K. N., Zulkarnain, A. K., & Lukitaningsih, E. (2023). Evaluation of the Physical Properties and Anti-aging Microemulgel Sunscreen Nyamplung Oil (Calophyllum inophyllum L.). *Tropical Journal of Natural Product Research*, *7*(2), 2414–2420. https://doi.org/10.26538/tjnpr/v7i2.18

Shaikh, M. Z., Ransing, R. D., & Usman, M. R. M. (2026). Phytochemical Fingerprinting and Quantitative Marker Profiling of Successive Solvent Extracts of Adhatoda vasica Roots Using TLC and HPTLC. *Int J Drug Deliv Technol*, *16*(15), 966–973. https://doi.org/10.25258/ijddt.16.15s.108

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
Sebagai Antioksidan dan Anti-Elastase Secara In Vitro
Fajar Hasmoro Carsita, Prof. Dr. apt. Abdul Karim Zulkarnain, M.Si.; Prof. Dr.rer.nat. apt. Endang Lukitaningsih, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Shejul, T. S., & Kudale, K. (2023). Facial Serum: Its Formulation, Usage, Special Ingredients, Various Types and Benefits. *International Journal of Pharmaceutical Research and Applications*, *8*(2), 680. https://doi.org/10.35629/7781-0802680692

Shin, S. H., Lee, Y. H., Rho, N. K., & Park, K. Y. (2023). Skin aging from mechanisms to interventions: focusing on dermal aging. *Frontiers in Physiology*, *14*(May), 1–10. https://doi.org/10.3389/fphys.2023.1195272

Shintre Aniruddha Dileep, Naikawadi Nishigandha Dayanand, V. K. R. (2020). Skin Aging and Herbal Anti-Aging Serums: A Comprehensive Review. *Asian Journal of Pharmaceutical Research and Development*, *8*(6), 77–80.

Siódmiak, J., Duleba, J., Mieszkowski, D., Bilski, P., & Siódmiak, T. (2025). SDS/Carbomer Dual-Stabilized Emulsion: An Efficient Pharmaceutical Formulation for Immobilized CALB Activity. *catalysts*, *15*(998), 1–19. https://doi.org/https://doi.org/ 10.3390/catal15100998

Socfindo Conservation. (2026). *Curculigo latifolia - Marasi*. socfindoconservation.co.id. https://www.socfindoconservation.co.id/plant/462

Stephenus, F. N., Benjamin, M. A. Z., Awang, A. A., & Azrie, M. (2023). Effect of Temperatures on Drying Kinetics, Extraction Yield, Phenolics, Flavonoids, and Antioxidant Activity of Phaleria macrocarpa (Scheff.) Boerl. (Mahkota Dewa) Fruits. *Foods*, *12*(2859), 1–19. https://doi.org/https://doi.org/10.3390/foods12152859

Suhail, N., Alzahrani, A. K., Basha, W. J., Kizilbash, N., Zaidi, A., Ambreen, J., & Khachfe, H. M. (2021). Microemulsions: Unique Properties, Pharmacological Applications, and Targeted Drug Delivery. *Frontiers in Nanotechnology*, *3*(November), 1–6. https://doi.org/10.3389/fnano.2021.754889

Sultana, S., Hossain, L., Sostaric, T., Lim, L. Y., Foster, K. J., & Locher, C. (2024). Investigating Flavonoids by HPTLC Analysis Using Aluminium Chloride as Derivatization Reagent. *Molecules*, *29*(5161), 1–14. https://doi.org/https://doi.org/10.3390/molecules29215161

Surahmaida, & Aisa, I. (2025). Pharmacognostic Study of Donkey Ear Taro Leaves (Alocasia polly). *Jurnal Biologi Tropis*, *25*(3).

Sykuła, A., Janiak-włodarczyk, I., & Kapusta, I. T. (2025). Formulation and Evaluation of the Antioxidant Activity of an Emulsion Containing a Commercial Green Tea Extract. *Molecules*, *30*(197), 1–15. https://doi.org/https://doi.org/10.3390/ molecules30010197

Talianu, M., Dinu-Pîrvu, C.-E., Ghica, M. V., Anuta, V., Jinga, V., & Popa, L. (2020). Foray into Concepts of Design and Evaluation of Microemulsions as a Modern Approach for Topical Applications in Acne Pathology. *Nanomaterials*, *10*(2292), 1–43. https://doi.org/doi:10.3390/nano10112292

Taufik, A. Y., Mohd Yasin, H., Ahmad, N., Arai, M., & Ja'afar, F. (2024). A review on the phytochemistry and biological activities of Curculigo latifolia Dryand ex. W.Aiton. *F1000Research*, *13*, 495. https://doi.org/10.12688/f1000research.148960.2

Taufik, A. Y., Yasin, H. M., Ahmad, N., Arai, M., & Ja'afar, F. (2024). An Investigation into the Phytochemical Content and Antioxidant, Antidiabetic,

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
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Fajar Hasmoro Carsita, Prof. Dr. apt. Abdul Karim Zulkarnain, M.Si.; Prof. Dr.rer.nat. apt. Endang Lukitaningsih, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

and Wound-Healing Activities of Curculigo latifolia Found in Brunei Darussalam. *Scientific World Journal*, *2024*. https://doi.org/10.1155/2024/5656744

Thombre, N., Saindane, R., More, D., & Kshirsagar, S. (2025). Implementation of Quality by Design in Generic Drug Product Development: A Case Study Using Diclofenac Sodium Sustained Release Tablets. *Jordan Journal of Pharmaceutical Sciences*, *18*(4), 924–942. https://doi.org/https://doi.org/10.35516/jjps.v18i4.2913

To'bungan, N. (2025). Standardization of Simplisia of Dutch Teak Leaves (Guazuma ulmifolia) and Root of Mud (Rheum officinale). *International Journal of Science, Technology and Applications*, *3*(1), 25–30. https://doi.org/https://doi.org/10.70115/ijsta.v3i1.272 Article

Tsabitah, A. F., Zulkarnain, A. K., Wahyuningsih, M. S. H., & Nugrahaningsih, D. A. A. (2020). Optimasi Carbomer, Propilen Glikol, dan Trietanolamin Dalam Formulasi Sediaan Gel Ekstrak Etanol Daun Kembang Bulan (Tithonia diversifolia). *Majalah Farmaseutik*, *16*(2), 111. https://doi.org/10.22146/farmaseutik.v16i2.45666

Tsouko, E., Alexandri, M., Fernandes, K. V., Freire, D. M. G., Mallouchos, A., & Koutinas, A. A. (2019). Extraction of Phenolic Compounds from Palm Oil Processing Residues and Their Application as Antioxidants. *Food Technology & Biotechnology*, *57*(1), 29–38. https://doi.org/https://doi.org/10.17113/ftb.57.01.19.5784

Umar, A. H., Ratnadewi, D., Rafi, M., Sulistyaningsih, Y. C., & Hamim, H. (2023). *Phenolics profile and antioxidant activities of in vitro propagules and field-raised plant organs of Curculigo latifolia*. *13*(04), 168–185. https://doi.org/10.7324/JAPS.2023.55995

Utami, Y. P., Sisang, S., & Burhan, A. (2020). PENGUKURAN PARAMETER SIMPLISIA DAN EKSTRAK ETANOL DAUN PATIKALA (Etlingera elatior (Jack) R.M. Sm) ASAL KABUPATEN ENREKANG SULAWESI SELATAN. *Majalah Farmasi dan Farmakologi*, *24*(1), 6–10. https://doi.org/10.20956/mff.v24i1.9831

Vijayakumar, R., Gani, S. S. A., & Mokhtar, N. F. (2017). ANTI-ELASTASE, ANTI-COLLAGENASE AND ANTIMICROBIAL ACTIVITIES OF THE UNDERUTILIZED RED PITAYA PEEL: AN IN VITRO STUDY FOR ANTI-AGING APPLICATIONS. *Asian Journal of Pharmaceutical and Clinical Research*, *10*(8), 251–255. https://doi.org/http://dx.doi.org/10.22159/ajpcr.2017.v10i8.19048

Vinardell, M. P., Maddaleno, A. S., & Mitjans, M. (2024). Harmonizing In Vitro Techniques for Anti-Aging Cosmetic Ingredient Assessment: A Comprehensive Review. *Cosmetics*, *11*(5). https://doi.org/10.3390/cosmetics11050170

Wang, H., Chen, Y., Wang, L., Liu, Q., Yang, S., & Wang, C. (2023). Advancing herbal medicine: enhancing product quality and safety through robust quality control practices. *Frontiers in Pharmacology*, *14*(1265178), 1–16. https://doi.org/10.3389/fphar.2023.1265178

Wang, M., You, S., Lee, H., Han, M., Lee, H., Mai, T., Pham, A., Na, Y., & Cho,

UNIVERSITAS GADJAH MADA
Pengembangan Formula Serum Mikroemulsi dari Ekstrak Terpurifikasi Daun Congkok (Curculigo Latifolia)
Sebagai Antioksidan dan Anti-Elastase Secara In Vitro
Fajar Hasmoro Carsita, Prof. Dr. apt. Abdul Karim Zulkarnain, M.Si.; Prof. Dr.rer.nat. apt. Endang Lukitaningsih, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

C. (2020). Development and Evaluation of Docetaxel-Phospholipid Complex Loaded Self-Microemulsifying Drug Delivery System: Optimization and In Vitro/Ex Vivo Studies. *Pharmaceutics*, *12*(544), 1–19. https://doi.org/10.3390/pharmaceutics12060544

Wang, Y., Liu, M., Li, J., Jiang, P., Han, D., Zhang, H., Xu, L., & Qiu, Y. (2024). Preparing a novel baicalin-loaded microemulsion-based gel for transdermal delivery and testing its anti-gout effect. *Saudi Pharmaceutical Journal*, *32*(6), 102100. https://doi.org/10.1016/j.jsps.2024.102100

Widiastuti, R., Nugroho, A. K., Martien, R., & Lukitaningsih, E. (2026). Systematic Screening of Oil, Surfactant, and Cosurfactant for Ibuprofen Nanoemulsion. *Journal of the Turkish Chemical Society A*, *1787016*, 1–12. https://doi.org/https://doi.org/10.18596/jotcsa.1787016

Widyaningrum, N., Arief, T. A., & Ningrum, Y. D. A. (2024). Optimization, Characterization, and Primary Irritation Test of Serum Based on Simplex Lattice Design. *Jurnal Kefarmasian Indonesia*, *14*(2), 176–184. https://doi.org/https://doi.org/10.22435/jki.v14i1.6650 Citation:

Wu, S., Zhou, X., Jin, Z., & Cheng, H. (2023). Collagenases and their inhibitors: a review. *Collagen and leather*, *5*(1). https://doi.org/10.1186/s42825-023-00126-6

Wulandari, R., Chandra, E. C., Arsiningtyas, I. S., Ni'maturrohmah, D., Suryani, A. E., Darsih, C., Haryanti, S., Rahmah, N. M., & Handayani, S. (2025). Physicochemical Evaluation and Anti-Aging Activity of The Cream Formulation Containing Aloe Vera and Rosella Extracts. *Indonesian Journal of Pharmacy*, *36*(4), 611–621. https://doi.org/10.22146/ijp.16388

Xie, M., Jiang, Z., Lin, X., & Wei, X. (2024). Application of plant extracts cosmetics in the field of anti-aging. *Journal of Dermatologic Science and Cosmetic Technology*, *1*(2), 100014. https://doi.org/10.1016/j.jdsct.2024.100014

Yara-Varón, E., Li, Y., Balcells, M., Canela-Garayoa, R., Fabiano-Tixier, A.-S., & Chemat, F. (2017). Vegetable Oils as Alternative Solvents for Green Oleo-Extraction, Purification and Formulation of Food and Natural Products. *Molecules*, *22*(1474), 1–24. https://doi.org/10.3390/molecules22091474

Zdrada-nowak, J., Aniołkowska, S., & Deska, M. (2025). The Evaluating Skin Acid–Base Balance After Application of Cold-Processed and Hot-Processed Natural Soaps: A Double-Blind pH Monitoring Study. *Cosmetics*, *12*(120), 1–12. https://doi.org/https:// doi.org/10.3390/cosmetics12030120

Zen, N. I. M., Gani, S. S. A., Shamsudin, R., & Masoumi, H. R. F. (2015). The Use of D-Optimal Mixture Design in Optimizing Development of Okara Tablet Formulation as a Dietary Supplement. *The Scientific World Journal*, *2015*, 1–7. https://doi.org/10.1155/2015/684319

Zhang, Y., Lane, M. E., & Moore, D. J. (2020). An Investigation of the Influence of PEG 400 and PEG-6-Caprylic / Capric Glycerides on Dermal Delivery of Niacinamide. *Polymers*, *12*(2907), 1–11. https://doi.org/10.3390/polym12122907

Zhou, X., Gong, X., Li, X., An, N., He, J., Zhou, X., & Zhao, C. (2023). The Antioxidant Activities In Vitro and In Vivo and Extraction Conditions

UNIVERSITAS
GADJAH MADA
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Sebagai Antioksidan dan Anti-Elastase Secara In Vitro
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Optimization of Defatted Walnut Kernel Extract. *Foods*, *12*(18), 1–17. https://doi.org/10.3390/foods12183417

Zulfaidah, N. T., Lukitaningsih, E., & Zulkarnain, A. K. (2023). Physical Stability, Photostability, and Sunscreen Effectiveness of Combination Cream of Arabica Green Coffee Bean Extract (Coffea arabica) and Octyl Methoxycinnamate. *Majalah Obat Tradisional*, *28*(2), 132–139. https://doi.org/10.22146/mot.84443

Zulqarnain, A., Durrani, A. I., Saleem, H., & Rubab, S. (2021). Development of an Ultrasonic-Assisted Extraction Technique for the Extraction of Natural Coloring Substance Chlorophyll from Leaves of Carica papaya. *Journal of Oleo Science*, *70*(10), 1367–1372. https://doi.org/10.5650/jos.ess21118