



DAFTAR PUSTAKA

- Anam Asghar, Muhammad Naeem Aamir, Muhammad Ajmal Shah, Shahzada Khurram Syed, dan Rabia Munir, 2021. Development, characterization and evaluation of in vitro anti-inflammatory activity of Withania coagulans extract and extract loaded microemulsion. *pakistan journal of pharmaceutical sciences*, **34**: .
- Andreassi, M., Stanghellini, E., Ettorre, A., Stefano, A.D., dan Andreassi, L., 2004. Antioxidant activity of topically applied lycopene. *European Academy of Dermatology and Venereology*, 4.
- Ascenso, A., Pinho, S., Eleutério, C., Praça, F.G., Bentley, M.V.L.B., Oliveira, H., dkk., 2013. Lycopene from Tomatoes: Vesicular Nanocarrier Formulations for Dermal Delivery. *Journal of Agricultural and Food Chemistry*, **61**: 7284–7293.
- 'Badan Pusat Statistik', , n.d. URL: <https://www.bps.go.id/indicator/55/62/1/produksi-tanaman-buah-buahan.html> (diakses tanggal 11/11/2021a).
- 'Badan Pusat Statistik', , n.d. URL: <https://www.bps.go.id/indicator/55/61/1/produksi-tanaman-sayuran.html> (diakses tanggal 11/11/2021b).
- Bae, S.H., Park, J.J., Song, E.J., Lee, J.A., Byun, K.S., Kim, N.S., dkk., 2016. The comparison of the melanin content and UV exposure affecting aging process: seven countries in Asia. *Journal of Cosmetic Dermatology*, **15**: 335–342.
- Bansal, M., Walia, M.K., Singh, G., dan Harikumar, S.L., 2019. FORMULATION AND EVALUATION OF LYCOPENE LOADED COLLOIDAL MICROPARTICLES GEL. *International Journal of Applied Pharmaceutics*, 165–170.
- Barbulova, A., Colucci, G., dan Apone, F., 2015. New Trends in Cosmetics: By-Products of Plant Origin and Their Potential Use as Cosmetic Active Ingredients. *Cosmetics*, **2**: 82–92.
- Butnariu, M.V. dan Giuchici, C.V., 2011. The use of some nanoemulsions based on aqueous propolis and lycopene extract in the skin's protective mechanisms against UVA radiation. *Journal of Nanobiotechnology*, **9**: 3.
- Carvalho, V.F., de Lemos, D.P., Vieira, C.S., Migotto, A., dan Lopes, L.B., 2017. Potential of Non-aqueous Microemulsions to Improve the Delivery of Lipophilic Drugs to the Skin. *AAPS PharmSciTech*, **18**: 1739–1749.
- Caseiro, M., Ascenso, A., Costa, A., Creagh-Flynn, J., Johnson, M., dan Simões, S., 2020. Lycopene in human health. *LWT*, **127**: 109323.
- Chen, J., Liu, Y., Zhao, Z., dan Qiu, J., 2021. Oxidative stress in the skin: Impact and related protection. *International Journal of Cosmetic Science*, **43**: 495–509.
- Chisté, R.C., Freitas, M., Mercadante, A.Z., dan Fernandes, E., 2014. Carotenoids inhibit lipid peroxidation and hemoglobin oxidation, but not the depletion of glutathione induced by ROS in human erythrocytes. *Life Sciences*, **99**:



52–60.

- Chou, T.-H., Nugroho, D.S., Chang, J.-Y., Cheng, Y.-S., Liang, C.-H., dan Deng, M.-J., 2021. Encapsulation and Characterization of Nanoemulsions Based on an Anti-oxidative Polymeric Amphiphile for Topical Apigenin Delivery. *Polymers*, **13**: 1016.
- Ciriminna, R., Fidalgo, A., Meneguzzo, F., Ilharco, L.M., dan Pagliaro, M., 2016. Lycopene: Emerging Production Methods and Applications of a Valued Carotenoid. *ACS Sustainable Chemistry & Engineering*, **4**: 643–650.
- Cronin, J.R., 2000. *The Biochemistry of Alternative Medicine* : Lycopene: The Powerful Antioxidant That Makes Tomatoes Red. *Alternative and Complementary Therapies*, **6**: 92–94.
- Darvin, M.E., Fluhr, J.W., Schanzer, S., Richter, H., Patzelt, A., Meinke, M.C., dkk., 2011. Dermal carotenoid level and kinetics after topical and systemic administration of antioxidants: Enrichment strategies in a controlled in vivo study. *Journal of Dermatological Science*, **64**: 53–58.
- de Winter, S., Pavel, S., Vink, A.A., dan Roza, L., 2001. Solar-Simulated Skin Adaptation and its Effect on Subsequent UV-Induced Epidermal DNA Damage. *Journal of Investigative Dermatology*, **117**: 678–682.
- Eichler, O., Sies, H., dan Stahl, W., 2002. Divergent Optimum Levels of Lycopene, α -Carotene and Lutein Protecting Against UVB Irradiation in Human Fibroblasts 5.
- Eudier, F., Grisel, M., Savary, G., dan Picard, C., 2020. Design of a Lipid-Coated Polymeric Material Mimic Human Skin Surface Properties: a Performing Tool to Evaluate Skin Interaction with Topical Products. *Langmuir*, **36**: 4582–4591.
- Fanun, M., 2011. Reprint of “Properties of microemulsions with mixed nonionic surfactants and citrus oil.” *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, **382**: 226–231.
- Fazekas, Z., Gao, D., Saladi, R.N., Lu, Y., Lebwohl, M., dan Wei, H., 2003. Protective Effects of Lycopene Against Ultraviolet B-Induced Photodamage. *Nutrition and Cancer*, **47**: 181–187.
- Fisk, W.A., Agbai, O., Lev-Tov, H.A., dan Sivamani, R.K., 2014. The use of botanically derived agents for hyperpigmentation: A systematic review. *Journal of the American Academy of Dermatology*, **70**: 352–365.
- Haag, S.F., Tscherch, K., Arndt, S., Kleemann, A., Gersonde, I., Lademann, J., dkk., 2014. Enhancement of skin radical scavenging activity and stratum corneum lipids after the application of a hyperforin-rich cream. *European Journal of Pharmaceutics and Biopharmaceutics*, **86**: 227–233.
- Haddad, A.L., Matos, L.F., Brunstein, F., Ferreira, L.M., Silva, A., dan Jr, D.C., 2003. comparing skin whitening complex with hydroquinone vs. placebo in the treatment of melasma. *International Journal of Dermatology*, **4**.
- He, E., Li, H., Li, X., Wu, X., Lei, K., dan Diao, Y., 2022. Transdermal Delivery of Indirubin-Loaded Microemulsion Gel: Preparation, Characterization and Anti-Psoriatic Activity. *International Journal of Molecular Sciences*, **23**: 3798.
- Heber, D. dan Lu, Q.-Y., 2002. Overview of Mechanisms of Action of Lycopene.



Experimental Biology and Medicine, **227**: 920–923.

- Jakka, D., Matadh, A.V., Shivakumar, H.N., Maibach, H., dan Murthy, S.N., 2022. Polymer Coated Polymeric (PCP) microneedles for sampling of drugs and biomarkers from tissues. *European Journal of Pharmaceutical Sciences*, **175**: 106203.
- Ke, L., Tan, Y., Xu, Y., Gao, G., Wang, H., Luo, S., dkk., 2022. Effects of peroxidase and superoxide dismutase on physicochemical stability of fish oil-in-water emulsion. *npj Science of Food*, **6**: 31.
- Kelkel, M., Schumacher, M., Dicato, M., dan Diederich, M., 2011. Antioxidant and anti-proliferative properties of lycopene. *Free Radical Research*, **45**: 925–940.
- Kolarsick, P.A.J., Kolarsick, M.A., dan Goodwin, C., 2011. Anatomy and Physiology of the Skin: *Journal of the Dermatology Nurses' Association*, **3**: 203–213.
- Kong, K.-W., Khoo, H.-E., Prasad, K.N., Ismail, A., Tan, C.-P., dan Rajab, N.F., 2010. Revealing the Power of the Natural Red Pigment Lycopene. *Molecules*, **15**: 959–987.
- Kun, Y., Ssonko Lule, U., dan Xiao-Lin, D., 2006. Lycopene: Its Properties and Relationship to Human Health. *Food Reviews International*, **22**: 309–333.
- LaBerge, G.S., Duvall, E., Grasmick, Z., Haedicke, K., Galan, A., Baswan, S., dkk., n.d. Recent Advances in Studies of Skin Color and Skin Cancer 13.
- Lademann, J., Meinke, M.C., Sterry, W., dan Darvin, M.E., 2011. Carotenoids in human skin: Carotenoids in human skin. *Experimental Dermatology*, **20**: 377–382.
- Li, Y., Yang, J., Zheng, Y., Ye, R., Liu, B., Huang, Y., dkk., 2021. Iontophoresis-driven porous microneedle array patch for active transdermal drug delivery. *Acta Biomaterialia*, **121**: 349–358.
- Limpongsa, E., Srisuk, P., dan Jaipakdee, N., 2019. PREPARATION AND CHARACTERIZATION OF GRAPEFRUIT OIL BASE MICROEMULSIONS OF CAFFEINE. *International Journal of Applied Pharmaceutics*, 231–238.
- Longo, C., Leo, L., dan Leone, A., 2012. Carotenoids, Fatty Acid Composition and Heat Stability of Supercritical Carbon Dioxide-Extracted-Oleoresins. *International Journal of Molecular Sciences*, **13**: 4233–4254.
- Mahajan, S.R., 2014. Screening of topical gel containing lycopene and dexamethasone against UV radiation induced photoaging in mice. *Biomedicine & Aging Pathology*, **4**: 303–308.
- Maione-Silva, L., Rocha, K.A.D., de Oliveira, L.C., Taveira, S.F., dan Lima, E.M., 2012. Development and Validation of a Simple and Rapid Liquid Chromatography Method for the Determination of Genistein in Skin Permeation Studies. *Biological and Pharmaceutical Bulletin*, **35**: 1986–1990.
- Mann, T., Eggers, K., Rippke, F., Tesch, M., Buerger, A., Darvin, M.E., dkk., 2020. High-energy visible light at ambient doses and intensities induces oxidative stress of skin—Protective effects of the antioxidant and Nrf2 inducer Licochalcone A in vitro and in vivo. *Photodermatology, Photoimmunology*



- & Photomedicine, **36**: 135–144.
- Mao, Y., Chen, X., Xu, B., Shen, Y., Ye, Z., Chaurasiya, B., dkk., 2019. Eprinomectin nanoemulgel for transdermal delivery against endoparasites and ectoparasites: preparation, *in vitro* and *in vivo* evaluation. *Drug Delivery*, **26**: 1104–1114.
- Mert, B., 2012. Using high pressure microfluidization to improve physical properties and lycopene content of ketchup type products. *Journal of Food Engineering*, **109**: 579–587.
- Moroni, M., Pirovano, M., Brugnatelli, S., Zucca, M., Morreale, M., Rizzo, V., dkk., 2021. Lycopene minimizes skin toxicity and oxidative stress in patients treated with panitumumab-containing therapy for metastatic colorectal cancer. *Journal of Functional Foods*, **83**: 104533.
- Motwani, M.S., Khan, K., Pai, A., dan Joshi, R., 2020. Efficacy of a collagen hydrolysate and antioxidants-containing nutraceutical on metrics of skin health in Indian women. *Journal of Cosmetic Dermatology*, **19**: 3371–3382.
- Muzumdar, S. dan Ferenczi, K., 2021. Nutrition and youthful skin. *Clinics in Dermatology*, .
- Nahhas, A.F., Abdel-Malek, Z.A., Kohli, I., Braunberger, T.L., Lim, H.W., dan Hamzavi, I.H., 2019. The potential role of antioxidants in mitigating skin hyperpigmentation resulting from ultraviolet and visible light-induced oxidative stress. *Photodermatology, Photoimmunology & Photomedicine*, **35**: 420–428.
- Nasir, A., 2010. Nanotechnology and dermatology: Part I—potential of nanotechnology. *Clinics in Dermatology*, **28**: 458–466.
- Nordlund, J., Grimes, P., dan Ortonne, J., 2006. The safety of hydroquinone: The safety of hydroquinone. *Journal of the European Academy of Dermatology and Venereology*, **20**: 781–787.
- Okonogi, S. dan Rianganapatee, P., 2015. Physicochemical characterization of lycopene-loaded nanostructured lipid carrier formulations for topical administration. *International Journal of Pharmaceutics*, **478**: 726–735.
- Ortonne, J.-P. dan Bissett, D.L., 2008. Latest Insights into Skin Hyperpigmentation. *Journal of Investigative Dermatology Symposium Proceedings*, **13**: 10–14.
- Parveen, R. dan Akhtar, N., 2014. Physico-chemical Characterization of Microemulsions Containing Plant Extract Using Non-ionic Surfactant. *Asian Journal of Chemistry*, **26**: 3649–3652.
- Pepe, D., Phelps, J., Lewis, K., DuJack, J., Scarlett, K., Jahan, S., dkk., 2012. Decylglucoside-based microemulsions for cutaneous localization of lycopene and ascorbic acid. *International Journal of Pharmaceutics*, **434**: 420–428.
- Pu, C. dan Tang, W., 2017. Encapsulation of lycopene in Chlorella pyrenoidosa : Loading properties and stability improvement. *Food Chemistry*, **235**: 283–289.
- Regazzetti, C., Sormani, L., Debayle, D., Bernerd, F., Tulic, M.K., De Donatis, G.M., dkk., 2018. Melanocytes Sense Blue Light and Regulate Pigmentation through Opsin-3. *Journal of Investigative Dermatology*, **138**: 171–178.



- Rendon, M. dan Horwitz, S., 2012. Topical treatment of hyperpigmentation disorders. *Annales de Dermatologie et de Vénéréologie*, **139**: S153–S158.
- Rizwan, M., Rodriguez-Blanco, I., Harbottle, A., Birch-Machin, M.A., Watson, R.E.B., dan Rhodes, L.E., 2011. Tomato paste rich in lycopene protects against cutaneous photodamage in humans in vivo: a randomized controlled trial: Photoprotection by lycopene. *British Journal of Dermatology*, **164**: 154–162.
- Roldán-Gutiérrez, J.M. dan Dolores Luque de Castro, M., 2007. Lycopene: The need for better methods for characterization and determination. *TrAC Trends in Analytical Chemistry*, **26**: 163–170.
- Sainy, J., Atneriya, U., Kori, J. lal, dan Maheshwari, R., 2021. Development of an *Aloe vera*-based Emulgel for the Topical Delivery of Desoximetasone. *Turkish Journal of Pharmaceutical Sciences*, **18**: 465–475.
- Santos, L.P. dos, Caon, T., Battisti, M.A., Silva, C.H.B. da, Simões, C.M.O., Reginatto, F.H., dkk., 2017. Antioxidant polymeric nanoparticles containing standardized extract of *Ilex paraguariensis* A. St.-Hil. for topical use. *Industrial Crops and Products*, **108**: 738–747.
- Sarheed, O., Shouqair, D., Ramesh, K.V.R.N.S., Khaleel, T., Amin, M., Boateng, J., dkk., 2020. Formation of stable nanoemulsions by ultrasound-assisted two-step emulsification process for topical drug delivery: Effect of oil phase composition and surfactant concentration and loratadine as ripening inhibitor. *International Journal of Pharmaceutics*, **576**: 118952.
- Sarkar, R., Arora, P., dan Garg, Kv., 2013. Cosmeceuticals for hyperpigmentation: What is available? *Journal of Cutaneous and Aesthetic Surgery*, **6**: 4.
- Shah, H., 2014. Screening of topical gel containing lycopene and dexamethasone against UV radiation induced photoaging in mice 6.
- Sharma, V.K., Sahni, K., dan Wadhwan, A.R., 2013. Photodermatoses in pigmented skin. *Photochem. Photobiol. Sci.*, **12**: 65–77.
- Sirikhet, J., Chanmahasathien, W., Raiwa, A., dan Kiattisin, K., 2021. Stability enhancement of lycopene in *Citrullus lanatus* extract via nanostructured lipid carriers. *Food Science & Nutrition*, **9**: 1750–1760.
- Sohail, M., Naveed, A., Abdul, R., Gulfishan, Muhammad Shoaib Khan, H., dan Khan, H., 2018. An approach to enhanced stability: Formulation and characterization of *Solanum lycopersicum* derived lycopene based topical emulgel. *Saudi Pharmaceutical Journal*, **26**: 1170–1177.
- Song, Y., Pan, Y., Wang, H., Liu, Q., dan Zhao, H., 2019. Mapping the face of young population in China: Influence of anatomical sites and gender on biophysical properties of facial skin. *Skin Research and Technology*, **25**: 325–332.
- Sungpud, C., Panpipat, W., Chaijan, M., dan Sae Yoon, A., 2020. Techno-biofunctionality of mangostin extract-loaded virgin coconut oil nanoemulsion and nanoemulgel. *PLOS ONE*, **15**: e0227979.
- Zair, M.A., Prasanthi, D., Chennuri, A., Hanthal, Z.R., dan Lakshmi, P.K., 2018. Effect of Transcutol and Stearylamine on Ibuprofen Hydrophilic Gel for Transdermal Delivery. *International Journal of Drug Delivery Technology*, **8**: .



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Sediaan

Topikal sebagai Antihiperpigmentasi

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Zanatta, C.F., Mitjans, M., Urgatondo, V., Rocha-Filho, P.A., dan Vinardell, M.P.,
2010. Photoprotective potential of emulsions formulated with Buriti oil
(*Mauritia flexuosa*) against UV irradiation on keratinocytes and fibroblasts
cell lines. *Food and Chemical Toxicology*, **48**: 70–75.