

## DAFTAR PUSTAKA

Akmal, T, Tanjung, YP, Julianti, AI, Lestari AG & Aljan 2024, 'Influence of extraction method on total phenolic content and antioxidant activity of sappan wood (*Caesalpinia sappan* L.) extract', *Sasambo Journal of Pharmacy*, vol. 5, no. 2, pp. 55-62, DOI:10.29303/sjp.v5i2.364.

Artati, Pratama, R, Nurisyah, N, Asyikin, A, Abdullah, T, Daswi, DR & Dewi, R 2025, 'Phytochemical testing, antioxidant activity and determination of specific and non-specific parameters of secang wood extract (*Caesalpinia sappan* L.)', *Jurnal Penelitian Pendidikan IPA*, vol. 11, no. 2, pp. 918-929, DOI:10.29303/jppipa.v11i2.10563.

Asevedo, EA, Santiago, LR, Kim, HJ, Syahputra, RA, Park, MN, Ribeiro, RIMA & Kim, B 2025, 'Unlocking the therapeutic mechanism of *Caesalpinia sappan*: a comprehensive review of its antioxidant and anti-cancer properties, ethnopharmacology, and phytochemistry', *Frontiers in Pharmacology*, vol. 15, pp. 1-24, DOI:10.3389/fphar.2024.1514573.

Bensa, T, Tekkela, S & Rognoni, E 2023, 'Skin fibroblast functional heterogeneity in health and disease', *The Journal of Pathology*, vol. 260, no. 5, pp. 609-620, DOI:10.1002/path.6159.

Bonnans, M, Fouque, L, Pelletier, M, Chabert, R, Pinacolo, S, Restellini, L & Cucumel, K 2020, 'Blue light: friend or foe?', *Journal of Photochemistry and Photobiology B: Biology*, vol. 212, pp. 1-8, DOI:10.1016/j.jphotobiol.2020.112026.

Boraldi, F, Lofaro, FD, Bonacorsi, S, Mazzilli, A, Garcia-Fernandez, M & Quagliano, D 2024, 'The role of fibroblasts in skin homeostasis and repair', *Biomedicines*, vol. 12, no. 7, pp. 1-28, DOI:10.3390/biomedicines12071586.

Budiyanto, A, Wirohadidjojo, YW, Syarif, RA, Anggreana, F, Arvianty, I, Khalidah, M, Noviandari, HA, Kristina, N, Fadhilah, NN & Kusumastuti, PP 2024, 'Antioxidant activity of ethanol extract of secang wood (*Caesalpinia sappan* L.) compared with 0.6% extract of *Artemisia capillaris* flower and their effects on cell viability in fibroblast exposed to blue light', *Manuscript submitted for publication to the Indonesian Journal of Biotechnology*.

Chamayou-Robert, C, DiGiorgio, C, Brack, O & Doucet, O 2022, 'Blue light induces DNA damage in normal human skin keratinocytes', *Photodermatology, Photoimmunology & Photomedicine*, vol. 38, no. 1, pp. 69-75, DOI:10.1111/phpp.12718.

Cios, A, Ciepielak, M, Szymanski, L, Lewicka, A, Cierniak, S, Stankiewicz, W, Mendrycka, M & Lewicki, S 2021, 'Effect of different wavelengths of laser irradiation

on the skin cells', *International Journal of Molecular Sciences*, vol. 22, no. 5, pp. 1-18, DOI:10.3390/ijms22052437.

Coats, JG, Maktabi, B, Abou-Dahech, MS & Baki, G 2021, 'Blue light protection, part I—effects of blue light on the skin', *Journal of Cosmetic Dermatology*, vol. 20, no. 3, pp. 714-717, DOI:10.1111/jocd.13837.

Csekes, E & Račková, L, 2021, 'Skin aging, cellular senescence and natural polyphenols', *International Journal of Molecular Sciences*, vol. 22, no. 23), pp. 12641. Available at: <https://doi.org/10.3390/ijms222312641>.

Demirci-Çekiç, S, Özkan, G, Avan, AN, Uzunboy, S, Çapanoğlu, E & Apak, R 2022, 'Biomarkers of oxidative stress and antioxidant defense', *Journal of Pharmaceutical and Biomedical Analysis*, vol. 209, pp. 1-26, DOI:10.1016/j.jpba.2021.114477.

Faisal, H & Handayani, S 2019, 'Comparison of antioxidant activity of ethanol extract of fruit and okra leaves (*Abelmoschus esculentus* L. Moench) by DPPH and ABTS methods', *Indonesian Journal of Pharmaceutical and Clinical Research*, vol. 2, no. 2, pp. 6-13, DOI:10.32734/idjpcr.v2i2.2815.

Garza, ZCF, Born, M, Hilbers, PAJ, Riel, NAWV & Liebmann J 2019, 'Visible blue light therapy: molecular mechanisms and therapeutic opportunities', *Current Medicinal Chemistry*, vol. 25, no. 40, pp. 5564–5577, DOI:10.2174/0929867324666170727112206.

Ge, G, Wang, Y, Xu, Y, Pu, W, Tan, Y, Liu, P, Ding, H, Lu, Y, Wang, J, Liu, W & Ma, Y 2023, 'Induced skin aging by blue-light irradiation in human skin fibroblasts via TGF- $\beta$ , JNK and EGFR pathways', *Journal of Dermatological Science*, vol. 111, no. 2, pp. 52–59, DOI:10.1016/j.jdermsci.2023.06.007.

Goldstein, S, Ballantyne, SR, Robson AL & Moerman EJ 1982, 'Energy metabolism in cultured human fibroblasts during aging in vitro', *Journal of Cellular Physiology*, vol. 112, no. 3, pp. 419-424, DOI:10.1002/jcp.1041120316.

Huang, AH & Chien, AL 2020, 'Photoaging: a review of current literature', *Current Dermatology Reports*, vol. 9, no. 1, pp. 22–29, DOI:10.1007/s13671-020-00288-0.

Janson, D, Rietveld, M, Willemze, R & Ghalbzouri, AE 2013, 'Effects of serially passaged fibroblasts on dermal and epidermal morphogenesis in human skin equivalents', *Biogerontology*, vol. 14, no. 2, pp. 131-140, DOI:10.1007/s10522-013-9416-9.

Karim, PL, Aryani, IA & Nopriyati 2021, 'Anatomy and histologic of intrinsic aging skin', *Bioscientia Medicina: Journal of Biomedicine and Translational Research*, vol. 5, no. 11, pp. 1165–1177, DOI:10.32539/bsm.v5i11.417.

Kim, KS, Park HK, Lee, JW, Kim, YI & Shin, MK 2015, 'Investigate correlation between mechanical property and aging biomarker in passaged human dermal fibroblasts', *Microscopy Research and Technique*, vol. 78, no. 4, pp. 277-282, DOI:10.1002/jemt.22472.

Kumari, J, Das, K, Babaei, M, Rokni, GR & Goldust, M 2023, 'The impact of blue light and digital screens on the skin', *Journal of Cosmetic Dermatology*, vol. 22, no. 4, pp. 1185–1190, DOI:10.1111/jocd.15576.

Kurniasari, L, Kumoro, AC & Djaeni, M 2024, 'Ultrasound assisted extraction of sappan wood (*Caesalpinia sappan* L.) using different solvents', *Food Research*, vol. 8, no. 1, pp. 23-28, DOI:10.26656/fr.2017.8(S1).4.

Kwong, SP, Wang, H, Shi, L, Huang, Z, Lu, B, Cheng, X, Chou, G, Ji, L & Wang, C 2020, 'Identification of photodegraded derivatives of usnic acid with improved toxicity profile and UVA/UVB protection in normal human L02 hepatocytes and epidermal melanocytes', *Journal of Photochemistry and Photobiology B: Biology*, vol. 205, pp. 1-12, DOI:10.1016/j.jphotobiol.2020.111814.

Laksmiani, NPL, Leliqia, NPE, Paramita, NLPV, Arijana, IGKN, Wijayanti, NPAD, Adiwibawa, PI, Putra, IMH & Pratama IPAAC 2022, 'Secang wood (*Caesalpinia sappan* L.) nanoemulgel activity as antiaging through suppressing the MMP-1 expression and the collagen degradation', *Journal of Pharmacy & Pharmacognosy Research*, vol. 10, no. 5, pp. 922-937, DOI:10.56499/jppres22.1456\_10.5.922.

Lee, H, Hong, Y & Kim, M 2021, 'Structural and functional changes and possible molecular mechanisms in aged skin', *International Journal of Molecular Sciences*, vol. 22, no. 22, p. 1-17, DOI:10.3390/ijms222212489.

Lephart, ED 2016, 'Skin aging and oxidative stress: equol's anti-aging effects via biochemical and molecular mechanisms', *Ageing Research Reviews*, vol. 31, pp. 36–54, DOI:10.1016/j.arr.2016.08.001.

Liebmann, J, Born, M & Kolb-Bachofen, V 2010, 'Blue-light irradiation regulates proliferation and differentiation in human skin cells', *Journal of Investigative Dermatology*, vol. 130, no. 1, pp. 259–269, DOI:10.1038/jid.2009.194.

Liu, H, Dong, J, Du, R, Gao, Y & Zhao, P 2024, 'Collagen study advances for photoaging skin', *Photodermatology, Photoimmunology & Photomedicine*, vol. 40, no. 1, pp. 1-7, DOI:10.1111/phpp.12931.

Makino, T, Jinnin, M, Muchemwa, FC, Fukushima, S, Kogushi-Nishi, H, Moriya, C, Igata, T, Fujisawa, A, Johno, T & Ihn, H 2010, 'Basic fibroblast growth factor stimulates the proliferation of human dermal fibroblasts via the ERK1/2 and JNK pathways: bFGF stimulates fibroblast proliferation via the ERK1/2 and JNK pathways', *British Journal of Dermatology*, vol. 162, no. 4, pp. 717-723, DOI:10.1111/j.1365-2133.2009.09581.x.

Masson-Meyers, DS, Bumah, VV & Enwemeka, CS 2016, 'A comparison of four methods for determining viability in human dermal fibroblasts irradiated with blue light', *Journal of Pharmacological and Toxicological Methods*, vol. 79, pp. 15-22, DOI:10.1016/j.vascn.2016.01.001.

McNish, H, Mathapathi, MS, Figlak, K, Damodaran, A, Birch-Machin, MA 2025, 'The effect of blue light on mitochondria in human dermal fibroblasts and the potential aging implications', *The FASEB Journal*, vol. 39, no. 11, pp. 1-5, DOI:10.1096/fj.202500746R.

Monteiro, MR, Tersario, ILDS, Lucena, SV, Moura, GEDDD & Steiner, D 2013, 'Culture of human dermal fibroblasts in the presence of hyaluronic acid and polyethylene glycol: effects on cell proliferation, collagen production, and related enzymes linked to the remodeling of the extracellular matrix', *Surgical and Cosmetic Dermatology*, vol. 5, no. 3, pp. 222-225.

Nakashima, Y, Ohta, S & Wolf, AM 2017, 'Blue light-induced oxidative stress in live skin', *Free Radical Biology & Medicine*, vol. 108, pp. 300-310, DOI:10.1016/j.freeradbiomed.2017.03.010

Nan, L, Guo, P, Hui, W, Xia, F & Yi, C 2025, 'Recent advances in dermal fibroblast senescence and skin aging: unraveling mechanisms and pioneering therapeutic strategies', *Frontiers in Pharmacology*, vol. 16, pp. 1-15. DOI:10.3389/fphar.2025.1592596.

Ozgen, S, Kilinc, OK & Selamoğlu, Z 2016, 'Antioxidant activity of quercetin: a mechanistic review', *Turkish Journal of Agriculture - Food Science and Technology*, vol. 4, no. 12, pp. 1134-1138, DOI:10.24925/turjaf.v4i12.1134-1138.1069.

Park, JI, Kim, SJ, Kim YJ & Lee, SJ 2022, 'Protective role of *Caesalpinia sappan* extract and its main component brazilin against blue light-induced damage in human fibroblasts', *Journal of Cosmetic Dermatology*, vol. 21, no. 12, pp. 7025-7034, DOI:10.1111/jocd.15354.

Parrado, C, Mercado-Saenz, S, Perez-Davo, A, Gilaberte, Y, Gonzalez, S & Juarranz, A 2019, 'Environmental stressors on skin aging. Mechanistic insights', *Frontiers in Pharmacology*, vol. 10, pp. 1-17, DOI:10.3389/fphar.2019.00759.

Plikus, MV, Wang, X, Sinha, S, Forte, E, Thompson, SM, Herzog, EL, Driskell, RR, Rosenthal, N, Biernaskie, J & Horsley, V 2021, 'Fibroblasts: Origins, definitions, and functions in health and disease', *Cell*, vol. 184, no. 15, pp. 3852–3872, DOI:10.1016/j.cell.2021.06.024.

Rajput, MS, Nirmal, NP, Nirmal, SJ & Santivarangkna, C 2022, 'Bio-actives from *Caesalpinia sappan* L.: recent advancements in phytochemistry and pharmacology', *South African Journal of Botany*, vol. 151, pp. 60-74, DOI:10.1016/j.sajb.2021.11.021.

Rohmah, A, Hafshah, M & Mardiyah, A 2022, 'Potential of secang wood (*Caesalpinia sappan* L.) ethanol extract as anti-oxidant and sun-protection', *Al-Kimia*, vol. 10, no. 2, pp. 126-132 DOI:10.24252/al-kimia.v10i2.28619.

Sadowska, M, Narbutt, J & Lesiak, A 2021, 'Blue light in dermatology', *Life*, vol. 11, no. 7, pp. 1-13, DOI:10.3390/life11070670.

Sahamastuti, AAT & Hartiadi, LY 2020, 'Protective effect of *Caesalpinia sappan* L. extract against H<sub>2</sub>O<sub>2</sub>-induced oxidative stress on HaCaT and its formulation as antioxidant cream', *Journal of Research in Pharmacy*, vol. 24, no. 4, pp. 508-517, DOI:10.35333/jrp.2020.199.

Shin, SH, Lee, YH, Rho, NK, & Park KY 2023, 'Skin aging from mechanisms to interventions: focusing on dermal aging', *Frontiers in Physiology*, vol. 14, pp. 1-10, DOI:10.3389/fphys.2023.1195272.

Stagos, D 2019, 'Antioxidant activity of polyphenolic plant extracts', *Antioxidants*, vol. 9, no. 1, pp. 1-7, DOI:10.3390/antiox9010019.

Suitthimeathegorn, O, Yang, C, Ma, Y & Liu, W 2022, 'Direct and indirect effects of blue light exposure on skin: a review of published literature', *Skin Pharmacology and Physiology*, vol. 35, pp. 305-318, DOI:10.1159/000526720.

Szerej, K, Kot, A, Wojtczak, M, Mysliwiec, N, Rozycki, A, Pniak, M, Miklis, P, Mawlichanow, M, Ciesielska, A & Sieradzka, A 2024, 'Unveiling the hidden dangers: the impact of blue light on skin health and aging', *Quality in Sport*, vol. 30, pp. 1-11, DOI:10.12775/QS.2024.30.56775.

Takashima, A 1998, 'Establishment of fibroblast cultures', *Current Protocols in Cell Biology*, vol. 2, pp. 1-12, DOI:10.1002/0471143030.cb0201s00.

Tewtrakul, S, Tungcharoen, P, Sudsai, T, Karalai, C, Ponglimanont, C & Yodsaoue, O 2015, 'Antiinflammatory and wound healing effects of *Caesalpinia sappan* L.', *Phytotherapy Research*, vol. 29, no. 6, pp. 850-856, DOI:10.1002/ptr.5321.

Tobin, DJ 2017, 'Introduction to skin aging', *Journal of Tissue Viability*, vol. 26, no. 1, pp. 37-46, DOI:10.1016/j.jtv.2016.03.002.

Vardhani, AK 2019, 'Caesalpinia sappan L: review article', *Proceedings of International Conference on Applied Science and Health*, no. 4, pp. 300–305.

Vij, T, Anil, PP, Shams, R, Dash, KK, Kalsi, R, Pandey, VK, Harsanyi, E, Kovacs, B & Shaikh, AM 2023, 'A comprehensive review on bioactive compounds found in *Caesalpinia sappan*', *Molecules*, vol. 28, no. 17, pp. 1-22, DOI:10.3390/molecules28176247.

Xu, D, Hu, MJ, Wang YQ & Cui, YL 2019, 'Antioxidant activities of quercetin and its complexes for medicinal application', *Molecules*, vol. 24, no. 6, pp. 1-15, DOI:10.3390/molecules24061123.

Zhang, J, Yu, H, Man, M & Hu, L 2024, 'Aging in the dermis: fibroblast senescence and its significance', *Aging Cell*, vol. 23, no. 2, pp. 1-11, DOI:10.1111/ace1.14054.

Zhang, S & Duan, E 2018, 'Fighting against skin aging: the way from bench to bedside', *Cell Transplantation*, vol. 27, no. 5, pp. 729-738, DOI:10.1177/0963689717725755.