

- Aboki, M., Mohammed, M., Musa, S., Aboki, M., Mohammed, M., Musa, S. H., Zuru, B. S., Aliyu, H. M., Alibe, I. M., & Inuwa, B. (2012). Physicochemical and antimicrobial properties of sunflower (*HELIANTHUS ANNUUS* L.) seed oil. *International Journal of Science and Technology Physicochemical and Anti-Microbial Properties of Sunflower (HELIANTHUS ANNUUS L.) Seed Oil. International Journal of Science and Technology*, 2(4). <http://www.ejournalofsciences.org>
- Alum, B. N. (2024). Saponification Process and Soap Chemistry. *INOSR APPLIED SCIENCES*, 12(2), 51–56. <https://doi.org/10.59298/INOSRAS/2024/12.2.515600>
- Amin, M., Anwar, K., Said, M., & Afizal, M. (2015). Overview on the Response Surface Methodology (RSM) in Extraction Processes. *Journal of Applied Science & Process Engineering*, 2(1). <https://www.researchgate.net/publication/281943340>
- Antończyk, A., Mika, M., & Wikiera, A. (2023). Influence of Synthetic Antioxidants Used in Food Technology on the Bioavailability and Metabolism of Lipids – In Vitro Studies. *Polish Journal of Food and Nutrition Sciences*, 73, 95–107. <https://doi.org/10.31883/pjfn/161366>
- Aparicio-Ruiz, R., Mínguez-Mosquera, M. I., & Gandul-Rojas, B. (2011). Thermal degradation kinetics of lutein, β -carotene and β -cryptoxanthin in virgin olive oils. *Journal of Food Composition and Analysis*, 24(6), 811–820. <https://doi.org/10.1016/j.jfca.2011.04.009>
- Attokaran, Mathew. (2011). *Natural food flavors and colorants*. Wiley. <https://doi.org/https://lcn.loc.gov/2016043324>
- Becerra, M. O., Contreras, L. M., Lo, M. H., Díaz, J. M., & Herrera, G. C. (2020). Lutein as a functional food ingredient: Stability and bioavailability. In *Journal of Functional Foods* (Vol. 66). Elsevier Ltd. <https://doi.org/10.1016/j.jff.2019.103771>
- Bhat, I., Jose, N. M., & Mamatha, B. S. (2023). Oxidative stability of lutein on exposure to varied extrinsic factors. *Journal of Food Science and Technology*, 60(3), 987–995. <https://doi.org/10.1007/s13197-022-05430-3>
- Binnal, P., & Babu, P. N. (2017). Production of high purity biodiesel through direct saponification of wet biomass of *Chlorella protothecoides* in a low cost microwave reactor: Kinetic and thermodynamic studies. *Korean Journal of Chemical Engineering*, 34(4), 1027–1036. <https://doi.org/10.1007/s11814-017-0002-8>
- Boonnoun, P., Opaskonkun, T., Prasitchoke, P., Goto, M., & Shotipruk, A. (2012). Purification of free lutein from marigold flowers by liquid chromatography. *Engineering Journal*, 16(5), 145–155. <https://doi.org/10.4186/ej.2012.16.5.145>
- Boonnoun, P., Tunyasitikun, P., Clowutimon, W., & Shotipruk, A. (2017). Production of free lutein by simultaneous extraction and de-esterification of marigold flowers in liquefied dimethyl ether (DME)–KOH–EtOH mixture. *Food and Bioprocess Technology*, 106, 193–200. <https://doi.org/10.1016/j.fbp.2017.10.002>
- Cai, X., Wu, J., Lian, Y., Yang, S., Xue, Q., Li, D., & Wu, D. (2024). Characterization and Discrimination of Marigold Oleoresin from Different Origins Based on UPLC-

- Cantrill, R. (2016). *Lutein esters from Tagetes erecta*, 82nd JECFA—Chemical and Technical Assessment (CTA).
- Chemat, F., Abert-Vian, M., Fabiano-Tixier, A. S., Strube, J., Uhlenbrock, L., Gunjevic, V., & Cravotto, G. (2019). Green extraction of natural products. Origins, current status, and future challenges. In *TrAC - Trends in Analytical Chemistry* (Vol. 118, pp. 248–263). Elsevier B.V. <https://doi.org/10.1016/j.trac.2019.05.037>
- Coiffard, L., & Couteau, C. (2020). Soap and syndets: Differences and analogies, sources of great confusion. *European Review for Medical and Pharmacological Sciences*, 24(21), 11432–11439. https://doi.org/10.26355/eurrev_202011_23637
- Dall'Osto, L., Cazzaniga, S., Bressan, M., Paleček, D., Židek, K., Niyogi, K. K., Fleming, G. R., Zigmantas, D., & Bassi, R. (2017). Two mechanisms for dissipation of excess light in monomeric and trimeric light-harvesting complexes. *Nature Plants*, 3. <https://doi.org/10.1038/nplants.2017.33>
- Davidov-Pardo, G., Gumus, C. E., & McClements, D. J. (2016). Lutein-enriched emulsion-based delivery systems: Influence of pH and temperature on physical and chemical stability. *Food Chemistry*, 196, 821–827. <https://doi.org/10.1016/j.foodchem.2015.10.018>
- Derrien, M., Badr, A., Gosselin, A., Desjardins, Y., & Angers, P. (2019). Optimization of a sustainable purification protocol for lutein and chlorophyll from spinach by-products by a saponification procedure using Box Behnken design and desirability function. *Food and Bioprocess Processing*, 116, 54–62. <https://doi.org/10.1016/j.fbp.2019.04.006>
- EFSA. (2010). Scientific Opinion on the appropriateness of the food azo-colours Tartrazine (E 102), Sunset Yellow FCF (E 110), Carmoisine (E 122), Amaranth (E 123), Ponceau 4R (E 124), Allura Red AC (E 129), Brilliant Black BN (E 151), Brown FK (E 154), Brown HT (E 155) and Litholrubine BK (E 180) for inclusion in the list of food ingredients set up in Annex IIIa of Directive 2000/13/EC. *EFSA Journal*, 8(10). <https://doi.org/10.2903/j.efsa.2010.1778>
- EFSA. (2012). Scientific Opinion on the re-evaluation of butylated hydroxytoluene BHT (E 321) as a food additive. *EFSA Journal*, 10(3). <https://doi.org/10.2903/j.efsa.2012.2588>
- European Union. (2011). *COMMISSION REGULATION (EU) No 1129/2011*. <https://doi.org/https://eur-lex.europa.eu/eli/reg/2011/1129/oj/eng>
- FAO and WHO. (2025). *Codex General Standard for Food Additives (GSFA) Online Database*. Food and Agriculture Organization and World Health Organization. [https://doi.org/https://www.fao.org/gsfaonline/additives/details.html;jsessionid=B0F3ED2D8CA79C6C70C364F7E9C0A3CB?id=189&d=3586470-o=2&d=3586470-s=5#:~:text=GSFA%20Online%20Food%20Additive%20Details%20for%20Butylated%20hydroxytoluene%20\(BHT\)&text=Note:%20Unless%20otherwise%20specified%2C%20food,Ripened%20Cheese%2C%20etc.\)](https://doi.org/https://www.fao.org/gsfaonline/additives/details.html;jsessionid=B0F3ED2D8CA79C6C70C364F7E9C0A3CB?id=189&d=3586470-o=2&d=3586470-s=5#:~:text=GSFA%20Online%20Food%20Additive%20Details%20for%20Butylated%20hydroxytoluene%20(BHT)&text=Note:%20Unless%20otherwise%20specified%2C%20food,Ripened%20Cheese%2C%20etc.))
- FDA. (2025, September 17). *Regulatory Status of Color Additives*. U.S. Department of Health & Human Services.

- Goula, A. M., Ververi, M., Adamopoulou, A., & Kaderides, K. (2017). Green ultrasound-assisted extraction of carotenoids from pomegranate wastes using vegetable oils. *Ultrasonics Sonochemistry*, 34, 821–830. <https://doi.org/10.1016/j.ultsonch.2016.07.022>
- Gouveia de Souza, A., Oliveira Santos, J. C., Conceição, M. M., Dantas Silva, M. C., & Prasad, S. (2004). A THERMOANALYTIC AND KINETIC STUDY OF SUNFLOWER OIL. *Brazilian Journal of Chemical Engineering*, 21(02), 265–273.
- Gülçin, I. (2012). Antioxidant activity of food constituents: An overview. In *Archives of Toxicology* (Vol. 86, Issue 3, pp. 345–391). <https://doi.org/10.1007/s00204-011-0774-2>
- Gulcin, İ., & Alwasel, S. H. (2023). DPPH Radical Scavenging Assay. In *Processes* (Vol. 11, Issue 8). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/pr11082248>
- Jaswir, I., Noviendri, D., Hasrini, R. F., & Octavianti, F. (2011). Carotenoids: Sources, medicinal properties and their application in food and nutraceutical industry. *Journal of Medicinal Plant Research*, 5(33), 7119–7131. <https://doi.org/10.5897/JMPRx11.011>
- Jivan, M. J., & Abbasi, S. (2019). Nano based lutein extraction from marigold petals: optimization using different surfactants and co-surfactants. *About the Journal Heliyon*, 5(4), 1–24. <https://doi.org/10.1016/j.heliyon.2019>
- Jivan, M. J., & Abbasi, S. (2020). Novel approach for lutein extraction: Food grade microemulsion containing soy lecithin & sunflower oil. *Innovative Food Science and Emerging Technologies*, 66. <https://doi.org/10.1016/j.ifset.2020.102505>
- Kashyap, P. K., Singh, S., Singh, M. K., Gupta, A., Tandon, S., Shanker, K., Verma, R. K., & Verma, R. S. (2022). An efficient process for the extraction of lutein and chemical characterization of other organic volatiles from marigold (*Tagetes erecta* L.) flower. *Food Chemistry*, 396. <https://doi.org/10.1016/j.foodchem.2022.133647>
- Khachik, F. (1995). *PROCESS FOR ISOLATION, PURIFICATION, AND RECRYSTALLIZATION OF LUTEIN FROM SAPONFIELD MARIGOLD OLEORESIN AND USES THEREOF* (Patent US5382714A). <https://patents.google.com/patent/US5382714A/en>
- Khairuddin, M. M., Abdullah, A., Dzulkifli, N. N., & Nor, N. M. (2023). OPTIMIZATION OF SUNFLOWER OIL HYDROLYSIS USING THE D-OPTIMAL DESIGN (Pengoptimuman Hidrolisis Minyak Bunga Matahari Menggunakan Reka Bentuk D-Optimal). In *Malaysian Journal of Analytical Sciences* (Vol. 27).
- Kljak, K., Grbeša, D., & Karolyi, D. (2014). Reflectance colorimetry as a simple method for estimating carotenoid content in maize grain. *Journal of Cereal Science*, 59(2), 109–111. <https://doi.org/10.1016/j.jcs.2013.12.004>

- Kopsell, D. A., & Kopsell, D. E. (2006). Accumulation and bioavailability of dietary carotenoids in vegetable crops. In *Trends in Plant Science* (Vol. 11, Issue 10, pp. 499–507). <https://doi.org/10.1016/j.tplants.2006.08.006>
- Kultys, E., & Kurek, M. A. (2022). Green Extraction of Carotenoids from Fruit and Vegetable Byproducts: A Review. *Molecules*, 27(518), 1–14. <https://doi.org/https://doi.org/10.3390/molecules27020518>
- Lara-Abia, S., Welte-Chanes, J., & Pilar Cano, M. (2022a). Effect of Ultrasound-Assisted Extraction of Carotenoids from Papaya (*Carica papaya* L. cv. Sweet Mary) Using Vegetable Oils. *Molecules*, 27(3). <https://doi.org/10.3390/molecules27030638>
- Lara-Abia, S., Welte-Chanes, J., & Pilar Cano, M. (2022b). Effect of Ultrasound-Assisted Extraction of Carotenoids from Papaya (*Carica papaya* L. cv. Sweet Mary) Using Vegetable Oils. *Molecules*, 27(3). <https://doi.org/10.3390/molecules27030638>
- Lavecchia, R., & Zuorro, A. (2008). *Shelf stability of lutein from marigold (Tagetes erecta L.) flowers in vegetable oils*. <https://doi.org/https://www.aidic.it/ibic2008/webpapers/69Lavecchia.pdf>
- Li, D., Xiao, Y., Zhang, Z., & Liu, C. (2015). Light-induced oxidation and isomerization of all-trans- β -cryptoxanthin in a model system. *Journal of Photochemistry and Photobiology B: Biology*, 142, 51–58. <https://doi.org/10.1016/j.jphotobiol.2014.11.003>
- Li, J., Ding, X., Zheng, J., Liu, D., Guo, F., Liu, H., & Zhang, Y. (2014). Determination of synthetic dyes in bean and meat products by liquid chromatography with tandem mass spectrometry. *Journal of Separation Science*, 37(17), 2439–2445. <https://doi.org/10.1002/jssc.201400349>
- Lozada, M. I. O., Rodrigues, D. B., Maldonado, I. R., Fernandes, T. de A., de Alencar, E. R., & de Oliveira, L. de L. (2025). Stability of lutein-based nanoemulsions under thermal and UVC-light exposure: Effect of lutein esterification and oil phase constitution. *Food Chemistry*, 492. <https://doi.org/10.1016/j.foodchem.2025.145401>
- Lozano-Alejo, N., Carrillo, G. V., Pixley, K., & Palacios-Rojas, N. (2007). Physical properties and carotenoid content of maize kernels and its nixtamalized snacks. *Innovative Food Science and Emerging Technologies*, 8(3), 385–389. <https://doi.org/10.1016/j.ifset.2007.03.015>
- Ly, B. C. K., Dyer, E. B., Feig, J. L., Chien, A. L., & Del Bino, S. (2020). Research Techniques Made Simple: Cutaneous Colorimetry: A Reliable Technique for Objective Skin Color Measurement. In *Journal of Investigative Dermatology* (Vol. 140, Issue 1, pp. 3-12.e1). Elsevier B.V. <https://doi.org/10.1016/j.jid.2019.11.003>
- Manupa, W., Wongthanyakram, J., Jeenchan, R., & Sutheerawattananonda, M. (2023). Storage stability and antioxidant activities of lutein extracted from yellow silk cocoons (*Bombyx mori*) in Thailand. *Heliyon*, 9(6). <https://doi.org/10.1016/j.heliyon.2023.e16805>
- Manzoor, S., Rashid, R., Prasad Panda, B., Sharma, V., & Azhar, M. (2022). Green extraction of lutein from marigold flower petals, process optimization and its potential to improve the oxidative stability of sunflower oil. *Ultrasonics Sonochemistry*, 85. <https://doi.org/10.1016/j.ultsonch.2022.105994>

- Maran, J. P., Manikandan, S., Thirugnanasambandham, K., Nivetha, C. V., & Dinesh, R. (2013). Box-Behnken design based statistical modeling for ultrasound-assisted extraction of corn silk polysaccharide. *Carbohydrate Polymers*, 92(1), 604–611. <https://doi.org/10.1016/j.carbpol.2012.09.020>
- Mushtaq, M., & Akram, S. (2019). Supercritical fluid based extraction of marigold principles. In *Green Sustainable Process for Chemical and Environmental Engineering and Science: Supercritical Carbon Dioxide as Green Solvent* (pp. 413–433). Elsevier. <https://doi.org/10.1016/B978-0-12-817388-6.00017-9>
- Muzammil, A., Riaz, F., Nadeem, H. U., Muzammil, S., Waris, K., Samra, H., & Siddique, M. H. (2020). *Green Sustainable Process for Chemical and Environmental Engineering and Science Plant-Derived Green Solvents: Properties and Applications* (Inamuddin, R. Boddula, & A. M. Asiri, Eds.). Elsevier Inc. <https://doi.org/10.1016/C2019-0-03693-X>
- Natchigal, A. M., Corrêa Bertoldi, B. M., & Stringheta, B. P. C. (2012). *Quantification and Characterization of Lutein from Tagetes (Tagetes patula L.) and Calendula (Calendula officinalis L.) Flowers*. <https://doi.org/10.17660/ActaHortic.2012.939.40>
- Palumpitag, W., Prasitchoke, P., Goto, M., & Shotipruk, A. (2011). Supercritical carbon dioxide extraction of marigold lutein fatty acid esters: Effects of cosolvents and saponification conditions. *Separation Science and Technology*, 46(4), 605–610. <https://doi.org/10.1080/01496395.2010.533739>
- Patsilinakos, A., Ragno, R., Carradori, S., Petralito, S., & Cesa, S. (2018). Carotenoid content of Goji berries: CIELAB, HPLC-DAD analyses and quantitative correlation. *Food Chemistry*, 268, 49–56. <https://doi.org/10.1016/j.foodchem.2018.06.013>
- Rahayuningsih, E., Wikansari, D. A., & Setiawan, H. (2016). Natural Colorants from *Cosmos Sulphureus* Cav. and *Tagetes Erecta* L.: Extraction And Characterization. *AJChE*, 16(2), 44–58. <https://doi.org/10.22146/ajche.49893>
- Rajib, G. (2020). *Orange Flowers With Green Leaves*. <https://www.pexels.com/@gm-Rajib-371406/>. <https://www.pexels.com/photo/orange-flowers-with-green-leaves-3524048/>
- Rumah Atsiri Indonesia. (2024, May 14). *Marigold Plaza*. <https://www.Rumahatsiri.Com/inside-Rumah-Atsiri/the-Gardens>. <https://www.instagram.com/p/C68jb06vAak/?igsh=MWxxeDZrZWJuYjlsNw%3D%3D>
- Sadano, S., Fujiwara, K., & Harada, K. (2007). METHOD FOR THE PURIFICATION OF MARIGOLD OLEORESIN. *United States Patent (Patent No: US 7,214,379 B2)*. <https://patents.google.com/patent/US7214379B2/en>
- Said, K. A. M., Afizal, M., & Amin, M. (2015a). Overview on the Response Surface Methodology (RSM) in Extraction Processes. *Journal of Applied Science & Process Engineering*, 2(1). <https://www.researchgate.net/publication/281943340>
- Said, K. A. M., Afizal, M., & Amin, M. (2015b). Overview on the Response Surface Methodology (RSM) in Extraction Processes. *Journal of Applied Science & Process Engineering*, 2(1). <https://www.researchgate.net/publication/281943340>

- Sarkar, C. R., Bhagawati, B., Das, L., & Goswami, B. C. (2012). An efficient condition of Saponification of Lutein ester from marigold flower. *Scholars Research Library Annals of Biological Research*, 2012(3), 1461–1466. <http://scholarsresearchlibrary.com/archive.html>
- Sharma, S., Das, A., Kumari, A., & Gupta, M. M. (2024). Technological insights into lutein isolation from marigold flower and their diverse applications: a compendious review. *Phytochemistry Reviews*. <https://doi.org/10.1007/s11101-024-09959-3>
- Shen, L., Pang, S., Zhong, M., Sun, Y., Qayum, A., Liu, Y., Rashid, A., Xu, B., Liang, Q., Ma, H., & Ren, X. (2023). A comprehensive review of ultrasonic assisted extraction (UAE) for bioactive components: Principles, advantages, equipment, and combined technologies. In *Ultrasonics Sonochemistry* (Vol. 101). Elsevier B.V. <https://doi.org/10.1016/j.ultsonch.2023.106646>
- Singh, T., Pandey, V. K., Dash, K. K., Zanzwar, S., & Singh, R. (2023). Natural bio-colorant and pigments: Sources and applications in food processing. *Journal of Agriculture and Food Research*, 12. <https://doi.org/10.1016/j.jafr.2023.100628>
- Slimani, C., Rais, C., Mansouri, F., Rais, S., Benjelloun, M., Ullah, R., Iqbal, Z., Goh, K. W., Lee, L. H., Bouyahya, A., & Lazraq, A. (2024). Optimization of ultrasound-assisted extraction of phenols from *Crocus sativus* by-products using sunflower oil as a sustainable solvent alternative. *Food Chemistry: X*, 23. <https://doi.org/10.1016/j.fochx.2024.101579>
- Song, J., Wang, X., Li, D., & Liu, C. (2017). Degradation kinetics of carotenoids and visual colour in pumpkin (*Cucurbita maxima* L.) slices during microwave-vacuum drying. *International Journal of Food Properties*, 20, S632–S643. <https://doi.org/10.1080/10942912.2017.1306553>
- Sophy, L. (2020, July 6). *Rumah Atsiri Indonesia, Destinasi Wisata Edukasi Menarik di Karanganyar*. <https://www.linatussophy.com/Rumah-Atsiri-Indonesia/>
<https://www.linatussophy.com/rumah-atsiri-indonesia/>
- Sowbhagya, H. B., Sampathu, S. R., & Krishnamurthy, N. (2004). Natural Colorant from Marigold-Chemistry and Technology. *Food Reviews International*, 20(1), 33–50. <https://doi.org/10.1081/FRI-120028829>
- Sowbhagya, H. B., Sushma, S. B., Rastogi, N. K., & Naidu, M. M. (2013). Effect of pretreatments on extraction of pigment from marigold flower. *Journal of Food Science and Technology*, 50(1), 122–128. <https://doi.org/10.1007/s13197-011-0313-4>
- Subagyo, M. D. A., & Broto, R. TD. W. (2024). Extraction of Crude Sunflower Seed Oil as a Vegetable Oil Rich in Antioxidant using the Microwave Assisted Extraction (MAE) Method. *Waste Technology*, 12(1), 10–15. <https://doi.org/10.14710/wastech.12.1.10-15>
- Sujith, A. P. A., Hymavathi, T. V., & Devi, P. Y. (2010). Supercritical Fluid Extraction of Lutein Esters. *International Journal of Biological, Life and Agricultural Sciences*, 4.

- Sukeksi, L., Sidabutar, A. J., & Sitorus, C. (2017). PEMBUATAN SABUN DENGAN MENGGUNAKAN KULIT BUAH KAPUK (*Ceiba petandra*) SEBAGAI SUMBER ALKALI SOAP MAKING BY USING KAPUK FRUIT PEEL (*Ceiba petandra*) AS A SOURCE OF ALKALI. In *Jurnal Teknik Kimia USU* (Vol. 6, Issue 3).
- Sun, Z., Li, T., Zhou, Z. G., & Jiang, Y. (2016). Microalgae as a source of lutein: Chemistry, biosynthesis, and carotenogenesis. *Advances in Biochemical Engineering/Biotechnology*, 153, 37–58. https://doi.org/10.1007/10_2015_331
- Telegina, T. A., Vechtomova, Y. L., Aybush, A. V., Buglak, A. A., & Kritsky, M. S. (2023). Isomerization of carotenoids in photosynthesis and metabolic adaptation. In *Biophysical Reviews* (Vol. 15, Issue 5, pp. 887–906). Springer Science and Business Media Deutschland GmbH. <https://doi.org/10.1007/s12551-023-01156-4>
- U.S. Department of Agriculture. (2021). *Sunflower oil (Survey (FNDDS), 1103867)* . <https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/food-surveys-research-group/docs/fndds-download-databases/>
- Vechpanich, J., & Shotipruk, A. (2011). Recovery of free lutein from *tagetes erecta*: Determination of suitable saponification and crystallization conditions. *Separation Science and Technology*, 46(2), 265–271. <https://doi.org/10.1080/01496395.2010.506904>
- Veza, I., Spraggon, M., Fattah, I. M. R., & Idris, M. (2023). Response surface methodology (RSM) for optimizing engine performance and emissions fueled with biofuel: Review of RSM for sustainability energy transition. In *Results in Engineering* (Vol. 18). Elsevier B.V. <https://doi.org/10.1016/j.rineng.2023.101213>
- Vidal, N. P., Adigun, O. A., Pham, T. H., Mumtaz, A., Manful, C., Callahan, G., Stewart, P., Keough, D., & Thomas, R. H. (2018). The effects of cold saponification on the unsaponified fatty acid composition and sensory perception of commercial natural herbal soaps. *Molecules*, 23(9). <https://doi.org/10.3390/molecules23092356>
- Wai, P. T., Jiang, P., Shen, Y., Zhang, P., Gu, Q., & Leng, Y. (2019). Catalytic developments in the epoxidation of vegetable oils and the analysis methods of epoxidized products. In *RSC Advances* (Vol. 9, Issue 65, pp. 38119–38136). Royal Society of Chemistry. <https://doi.org/10.1039/c9ra05943a>
- Wang, J., & Wan, W. (2009). Experimental design methods for fermentative hydrogen production: A review. In *International Journal of Hydrogen Energy* (Vol. 34, Issue 1, pp. 235–244). <https://doi.org/10.1016/j.ijhydene.2008.10.008>
- Wang, M., Tsao, R., Zhang, S., Dong, Z., Yang, R., Gong, J., & Pei, Y. (2006). Antioxidant activity, mutagenicity/anti-mutagenicity, and clastogenicity/anti-clastogenicity of lutein from marigold flowers. *Food and Chemical Toxicology*, 44(9), 1522–1529. <https://doi.org/10.1016/j.fct.2006.04.005>
- Wang, T., Han, J., Tian, Y., Zhang, D., Wang, Y., Wu, Y., & Ni, L. (2016). Combined process of reaction, extraction, and purification of lutein in marigold flower by isopropanol–KOH aqueous two-phase system. *Separation Science and Technology (Philadelphia)*, 51(9), 1490–1498. <https://doi.org/10.1080/01496395.2016.1166136>

- Wang, X., Ding, Z., Zhao, Y., Prakash, S., Liu, W., Han, J., & Wang, Z. (2021). Effects of lutein particle size in embedding emulsions on encapsulation efficiency, storage stability, and dissolution rate of microencapsules through spray drying. *LWT*, 146. <https://doi.org/10.1016/j.lwt.2021.111430>
- Xian-Qing, W., Man, L., Yan-Yan, L., & Ying, L. (2015). Analysis of influence factors on extraction rate of lutein from marigold and optimization of saponification conditions. *Advance Journal of Food Science and Technology*, 8(5), 331–336. <https://doi.org/10.19026/ajfst.8.1518>
- Xiao, Y. dong, Huang, W. yang, Li, D. jing, Song, J. feng, Liu, C. quan, Wei, Q. yu, Zhang, M., & Yang, Q. ming. (2018). Thermal degradation kinetics of all-trans and cis-carotenoids in a light-induced model system. *Food Chemistry*, 239, 360–368. <https://doi.org/10.1016/j.foodchem.2017.06.107>
- X-Rite Inc. (2016). *A Guide to Understanding Color*. X-Rite Incorporated. https://www.xrite.com/-/media/xrite/files/whitepaper_pdfs/110-001_a_guide_to_understanding_color_communication/110-001_understanding_color_en.pdf
- Yao, Y., Lin, J. J., Chee, X. Y. J., Liu, M. H., Khan, S. A., & Kim, J. E. (2021). Encapsulation of lutein via microfluidic technology: Evaluation of stability and in vitro bioaccessibility. *Foods*, 10(11). <https://doi.org/10.3390/foods10112646>
- Yara-Varón, E., Fabiano-Tixier, A. S., Balcells, M., Canela-Garayoa, R., Bily, A., & Chemat, F. (2016). Is it possible to substitute hexane with green solvents for extraction of carotenoids? A theoretical versus experimental solubility study. *RSC Advances*, 6(33), 27750–27759. <https://doi.org/10.1039/c6ra03016e>
- 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. In *Molecules* (Vol. 22, Issue 9). MDPI AG. <https://doi.org/10.3390/molecules22091474>
- Yeo, J., & Shahidi, F. (2019). Revisiting DPPH (2,2-diphenyl-1-picrylhydrazyl) assay as a useful tool in antioxidant evaluation: a new IC100 concept to address its limitations. *Journal of Food Bioactives*, 36–42. <https://doi.org/10.31665/jfb.2019.7196>
- Yuniati, Y., Azmi, D. D., Nurandriea, E., Qadariyah, L., & Mahfud. (2023). Parametric Study and Characterization of Sappan Wood (*Caesalpinia Sappan* Linn) Natural Red Colorant Extract with Ultrasonic Assisted Extraction Method. *ASEAN Journal of Chemical Engineering*, 23(1), 103–112. <https://doi.org/10.22146/ajche.77249>
- Zan, M., Wang, X., Amuti, A., Wang, Z., & Dang, L. (2021). Saponification of peony seed oil using response surface methodology. *Industrial Crops and Products*, 173. <https://doi.org/10.1016/j.indcrop.2021.114134>
- Zheng, H., Wang, Y., Li, S., Nagarajan, D., Varjani, S., Lee, D. J., & Chang, J. S. (2022). Recent advances in lutein production from microalgae. *Renewable and Sustainable Energy Reviews*, 153. <https://doi.org/10.1016/j.rser.2021.111795>