

DAFTAR PUSTAKA

- Abdelbaky, A.S., Mohamed, A.M.H.A., Sharaky, M., Mohamed, N.A., and Diab, Y.M., 2023, Green approach for the synthesis of ZnO nanoparticles using Cymbopogon citratus aqueous leaf extract: characterization and evaluation of their biological activities, *Chem. Biolog. Technol. Agricul.*, 10, 63.
- Abdullah, J.A.A., Jiménez-Rosado, M., Guerrero, A., and Romero, A., 2022, Biopolymer-Based Films Reinforced with Green Synthesized Zinc Oxide Nanoparticles, *Polymers (Basel)*, 14, 5202.
- Abedi-Firoozjah, R., Yousefi, S., Heydari, M., Seyedfatehi, F., Jafarzadeh, S., Mohammadi, R., Rouhi, M., and Garavand, F., 2022, Application of Red Cabbage Anthocyanins as pH-Sensitive Pigments in Smart Food Packaging and Sensors, *Polymers (Basel)*, 14, 1629.
- Ahliha, A.H., Nurosyid, F., Supriyanto, A., and Kusumaningsih, T., 2017, The chemical bonds effect of anthocyanin and chlorophyll dyes on TiO₂ for dye-sensitized solar cell (DSSC), *J Phys Conf Ser*, 909, 012013.
- Ahmadiani, N., Sigurdson, G.T., Robbins, R.J., Collins, T.M., and Giusti, M.M., 2019, Solid phase fractionation techniques for segregation of red cabbage anthocyanins with different colorimetric and stability properties, *Food Res. Int*, 120, 688–696.
- Al-darwesh, M.Y., Ibrahim, S.S., and Mohammed, M.A., 2024, A Review on Plant Extract Mediated Green Synthesis of Zinc oxide Nanoparticles and Their biomedical Applications, *Results Chem*, 101368.
- Alekish, M., Ismail, Z.B., Albiss, B., and Nawasrah, S., 2018, In vitro antibacterial effects of zinc oxide nanoparticles on multiple drug-resistant strains of Staphylococcus aureus and Escherichia coli: An alternative approach for antibacterial therapy of mastitis in sheep, *Vet World*, 11, 1428–1432.
- Al-Ogaidi, I.A.Z., 2017, Camellia sinensis (Green Tea) Mediated Synthesis of Zinc Oxide Nanoparticles and Detect its Antibacterial Activity against Escherichia coli, Staphylococcus aureus and Acinetobacter baumannii, *J. Biotechnol. Res. Center*, 11, 34–40.
- Alprol, A.E., Mansour, A.T., El-Beltagi, H.S., and Ashour, M., 2023, Algal Extracts for Green Synthesis of Zinc Oxide Nanoparticles: Promising Approach for Algae Bioremediation, *Materials*, 16, 4446.
- Alshameri, A.W. and Owais, M., 2022, Antibacterial and cytotoxic potency of the plant-mediated synthesis of metallic nanoparticles Ag NPs and ZnO NPs: A review, *OpenNano*, 8, 100077.
- Amaregouda, Y., Kamanna, K., and Kamath, A., 2023, Multifunctional Bionanocomposite Films Based on Chitosan/Polyvinyl Alcohol with ZnO

NPs and Carissa carandas Extract Anthocyanin for Smart Packaging Materials, *ACS Food Sci. Technol.*, 3, 1411–1422.

- Ansari, M.A., Murali, M., Prasad, D., Alzohairy, M.A., Almatroudi, A., Alomary, M.N., Udayashankar, A.C., Singh, S.B., Asiri, S.M.M., Ashwini, B.S., Gowtham, H.G., Kalegowda, N., Amruthesh, K.N., Lakshmeesha, T.R., and Niranjana, S.R., 2020, Cinnamomum verum Bark Extract Mediated Green Synthesis of ZnO Nanoparticles and Their Antibacterial Potentiality, *Biomolecules*, 10, 336.
- Anugrah, D.S.B., Darmalim, L.V., Sinanu, J.D., Pramitasari, R., Subali, D., Prasetyanto, E.A., and Cao, X.T., 2023, Development of alginate-based film incorporated with anthocyanins of red cabbage and zinc oxide nanoparticles as freshness indicator for prawns, *Int J Biol Macromol*, 251, 126203.
- Araújo, A.C. de, Gomes, J.P., Silva, F.B. da, Nunes, J.S., Santos, F.S. dos, Silva, W.P. da, Ferreira, J.P. de L., Queiroz, A.J. de M., Figueirêdo, R.M.F. de, Lima, G.S. de, Soares, L.A. dos A., Rocha, A.P.T., and Lima, A.G.B. de, 2023, Optimization of Extraction Method of Anthocyanins from Red Cabbage, *Molecules*, 28, 3549.
- Attia, N.F., Moussa, M., Sheta, A.M.F., Taha, R., and Gamal, H., 2017, Effect of different nanoparticles based coating on the performance of textile properties, *Prog Org Coat*, 104, 72–80.
- Ayinde, W.B., Dare, E.O., Bada, D.A., Alayande, S.O., Oladoyinbo, F.O., Idowu, M.A., Bolaji, Bukola.O., Ezech, M.I., and Osuji, R.U., 2017, Dye-modified ZnO nanohybrids: optical properties of the potential solar cell nanocomposites, *Int Nano Lett*, 7, 171–179.
- Azlan, F.A., Rahmahwati, A., and Nordin, A., 2022, A Review on Antibacterial Activity of Green Synthesis Zinc Oxide Nanoparticle, *Res. Prog. Mech. Manuf. Eng.*, 3, 414–423.
- Babayevska, N., Przysiecka, Ł., Iatsunskyi, I., Nowaczyk, G., Jarek, M., Janiszewska, E., and Jurga, S., 2022, ZnO size and shape effect on antibacterial activity and cytotoxicity profile, *Sci Rep*, 12, 8148.
- Bachtiar, A.R., Handayani, S., and Ahmad, A.R., 2023, Penetapan Kadar Flavonoid Total Buah Dengen (Dillenia serrata) Menggunakan Metode Spektrofotometer UV-Vis, *Makassar Nat. Prod. J.*, 1, 86–101.
- Bayisa, T., Bajhal, S., Sundaramurthy, A., Kapoor, A., Tan, K.H., Rahman, S., Gupta, N.K., and Edossa, G.D., 2023, Stabilization of Ag Nanoparticles and ZnO–Ag Nanocomposite onto L-Methionine-Modified Cotton Fabric for Antibacterial Durability, *Fibers Polym.*, 24, 3537–3555.
- Bennison, L.R., Miller, C.N., Summers, R.J., Minnis, A.M.B., Sussman, G., and McGuiness, W., 2017, The pH of wounds during healing and infection: a descriptive literature review, *Wound Pract. Res.*, 25, 63–69.

- Bhattacharjee, N., Som, I., Saha, R., and Mondal, S., 2022, A critical review on novel eco-friendly green approach to synthesize zinc oxide nanoparticles for photocatalytic degradation of water pollutants, *Int J Environ Anal Chem*, 1–28.
- Bianchera, A., Catanzano, O., Boateng, J., and Elviri, L., 2020, The Place of Biomaterials in Wound Healing,. In, *Ther. Dressings Wound Heal. Appl.* Wiley, pp. 337–366.
- Bubonja-Šonje, M., Knežević, S., and Abram, M., 2020, Challenges to antimicrobial susceptibility testing of plant-derived polyphenolic compounds, *Arh. Hig. Rada Toksikol.*, 71, 300–311.
- Bukhari, A., Ijaz, I., Gilani, E., Nazir, A., Zain, H., Saeed, R., Alarfaji, S.S., Hussain, S., Aftab, R., and Naseer, Y., 2021, Green Synthesis of Metal and Metal Oxide Nanoparticles Using Different Plants' Parts for Antimicrobial Activity and Anticancer Activity: A Review Article, *Coatings*, 11, 1374.
- Caicedo, C., Melo-López, L., Cabello-Alvarado, C., Cruz-Delgado, V.J., and Ávila-Orta, C.A., 2019, Biodegradable polymer nanocomposites applied to technical textiles: A review, *DYNA (Colombia)*, 86, 288–299.
- Carvalho, V.V.L., Gonçalves, J.O., Silva, A., Cadaval, T.R., Pinto, L.A.A., and Lopes, T.J., 2019, Separation of anthocyanins extracted from red cabbage by adsorption onto chitosan films, *Int J Biol Macromol*, 131, 905–911.
- Chen, S., Wu, M., Lu, P., Gao, L., Yan, S., and Wang, S., 2020, Development of pH indicator and antimicrobial cellulose nanofibre packaging film based on purple sweet potato anthocyanin and oregano essential oil, *Int J Biol Macromol*, 149, 271–280.
- Daris, U.S., Syam, H., and Sukainah, A., 2023, Uji Daya Hambat serta Penentuan Minimum Inhibitor Concentration (MIC) Dan Minimum Bactericidal Concentration (MBC) Ekstrak Daun Bidara Terhadap Bakteri Patogen, *J. Pend. Teknol. Pertan.*, 9, 223–234.
- Deng, K., Ouyang, J., Hu, N., Meng, J., Su, C., Wang, J., and Wang, H., 2022, Improved colorimetric analysis for subtle changes of powdered anthocyanins extracted from *Lycium ruthenicum* Murr., *Food Chem*, 371, 131080.
- Doğan, S.Ş. and Kocabaş, A., 2020, Green synthesis of ZnO nanoparticles with *Veronica multifida* and their antibiofilm activity, *Hum Exp Toxicol*, 39, 319–327.
- Dong, R. and Guo, B., 2021, Smart wound dressings for wound healing, *Nano Today*, 41, 101290.
- Dumbrava, A., Berger, D., Matei, C., Prodan, G., Aonofriesei, F., Radu, M.D., and Moscalu, F., 2019, New Composite Nanomaterials with Antimicrobial and Photocatalytic Properties Based on Silver and Zinc Oxide, *J Inorg Organomet Polym Mater*, 29, 2072–2082.

- Efendi, R., Pradana, R.I., Cahyani, C., and Dewi, L.K., 2022, The Effect of Drying on Anthocyanin Content and Antioxidant Activity in Red Cabbage and White Cabbage, *Reaktor*, 22, 86–91.
- Ekici, L., Simsek, Z., Ozturk, I., Sagdic, O., and Yetim, H., 2014, Effects of Temperature, Time, and pH on the Stability of Anthocyanin Extracts: Prediction of Total Anthocyanin Content Using Nonlinear Models, *Food Anal Methods*, 7, 1328–1336.
- Enaru, B., Dreţcanu, G., Pop, T.D., Stănilă, A., and Diaconeasa, Z., 2021, Anthocyanins: Factors affecting their stability and degradation, *Antioxidants*, 10, 1967.
- Eskandarabadi, S.M., Mahmoudian, M., Farah, K.R., Abdali, A., Nozad, E., and Enayati, M., 2019, Active intelligent packaging film based on ethylene vinyl acetate nanocomposite containing extracted anthocyanin, rosemary extract and ZnO/Fe-MMT nanoparticles, *Food Packag Shelf Life*, 22, 100389.
- Etxabide, A., Kilmartin, P.A., and Maté, J.I., 2021, Color stability and pH-indicator ability of curcumin, anthocyanin and betanin containing colorants under different storage conditions for intelligent packaging development, *Food Control*, 121, 107645.
- Farahani, M. and Shafiee, A., 2021, Wound Healing: From Passive to Smart Dressings, *Adv Healthc Mater*, 10, 2100477.
- Fathi, M., Samadi, M., Abbaszadeh, S., and Nourani, M.R., 2022, Fabrication and characterization of multifunctional bio-safe films based on Carboxymethyl Chitosan and Saffron Petal Anthocyanin Reinforced with Copper Oxide Nanoparticles for sensing the meat freshness, *J Polym Environ*, 30, 4538–4549.
- Fierri, I., De Marchi, L., Chignola, R., Rossin, G., Bellumori, M., Perbellini, A., Mancini, I., Romeo, A., Ischia, G., Saorin, A., Mainente, F., and Zoccatelli, G., 2023, Nanoencapsulation of Anthocyanins from Red Cabbage (*Brassica oleracea* L. var. *Capitata* f. *rubra*) through Coacervation of Whey Protein Isolate and Apple High Methoxyl Pectin, *Antioxidants*, 12, 1757.
- Freitas, P.A.V., de Oliveira, T. V., Silva, R.R.A., Fialho e Moraes, A.R., Pires, A.C. dos S., Soares, R.R.A., Junior, N.S., and Soares, N.F.F., 2020, Effect of pH on the intelligent film-forming solutions produced with red cabbage extract and hydroxypropylmethylcellulose, *Food Packag Shelf Life*, 26, 100604.
- Galvão, A.C., Souza, P.P., Robazza, W.S., and França, C.A.L., 2020, Capacity of solutions involving organic acids in the extraction of the anthocyanins present in jabuticaba skins (*Myrciaria cauliflora*) and red cabbage leaves (*Brassica oleracea*), *J Food Sci Technol*, 57, 3995–4002.

- Gatou, M.A., Lagopati, N., Vagena, I.A., Gazouli, M., and Pavlatou, E.A., 2023, ZnO Nanoparticles from Different Precursors and Their Photocatalytic Potential for Biomedical Use, *Nanomaterials*, 13, 122.
- Gençdağ, E., Özdemir, E.E., Demirci, K., Görgüç, A., and Yılmaz, F.M., 2022, Copigmentation and stabilization of anthocyanins using organic molecules and encapsulation techniques, *Curr Plant Biol*, 29, 100238.
- Ghareaghajlou, N., Hallaj-Nezhadi, S., and Ghasempour, Z., 2021, Red cabbage anthocyanins: Stability, extraction, biological activities and applications in food systems, *Food Chem*, 365, 130482.
- Gupta, B., Agarwal, R., and Alam, M.S., 2010, Textile-based smart wound dressings, *Ind J Fibre Textile Res*, 35, 174–187.
- Halász, K., Kóczán, Z., and Joóbné Preklet, E., 2023, pH-dependent color response of cellulose-based time-temperature indicators impregnated with red cabbage extract, *J. Food Meas. Charact.*, 17, 2555–2565.
- Hamed, R., Obeid, R.Z., and Abu-Huwaij, R., 2023, Plant mediated-green synthesis of zinc oxide nanoparticles: An insight into biomedical applications, *Nanotechnol Rev*, 12, .
- Handago, D.T., Zereffa, E.A., and Gonfa, B.A., 2019, Effects of Azadirachta Indica Leaf Extract, Capping Agents, on the Synthesis of Pure and Cu Doped ZnO-Nanoparticles: A Green Approach and Microbial Activity, *Open Chem*, 17, 246–253.
- Hosseinizadeh, E., Foroumadi, A., and Firoozpour, L., 2023, What is the role of phytochemical compounds as capping agents for the inhibition of aggregation in the green synthesis of metal oxide nanoparticles? A DFT molecular level response, *Inorg Chem Commun*, 147, 110243.
- Huang, S., Wang, G., Lin, H., Xiong, Y., Liu, X., and Li, H., 2021, Preparation and dynamic response properties of colorimetric indicator films containing pH-sensitive anthocyanins, *Sens. Actuators Rep.*, 3, 100049.
- Huang, Y., Zhou, S., Zhao, G., and Ye, F., 2021, Destabilisation and stabilisation of anthocyanins in purple-fleshed sweet potatoes: A review, *Trends Food Sci Technol*, 116, 1141–1154.
- Hussein, S., Taha, G., and Moghazy, M., 2023, Comparative Study on Synthesis ZnO Nanoparticles Using Green and Chemical Methods and Its Effect on Crystallite Size and Optical Properties, *Aswan Univ J Environ Stud*, 4, 205–218.
- Ishwarya, R., Vaseeharan, B., Kalyani, S., Banumathi, B., Govindarajan, M., Alharbi, N.S., Kadaikunnan, S., Al-anbr, M.N., Khaled, J.M., and Benelli, G., 2018, Facile green synthesis of zinc oxide nanoparticles using Ulva lactuca seaweed extract and evaluation of their photocatalytic, antibiofilm and insecticidal activity, *J Photochem Photobiol B*, 178, 249–258.

- Jahangir, H.Syed., Tamil, T.Kumar., Mary, M.Concelia., and Alamelu, R., 2020, Green synthesis, characterization and antibacterial studies of silver (Ag) and zinc oxide (ZnO) nanoparticles, *J Pure Appl Microbiol*, 14, 1999–2008.
- Jankowska, D.A., Bannwarth, M.B., Schulenburg, C., Faccio, G., Maniura-Weber, K., Rossi, R.M., Scherer, L., Richter, M., and Boesel, L.F., 2017, Simultaneous detection of pH value and glucose concentrations for wound monitoring applications, *Biosens Bioelectron*, 87, 312–319.
- Javed, M.N., Bangash, S.A.K., Abbas, M., Ahmed, S., Kaplan, A., Iqbal, S., Khan, M.N., Adnan, M., Ali, A., Zaman, F., and Wahab, S., 2023, Potential and Challenges in Green Synthesis of Nanoparticles: A Review, *J. Xi'an Shiyu Univ. Nat. Sci. Ed.*, 19, 1155–1165.
- Javed, R., Zia, M., Naz, S., Aisida, S.O., Ain, N. ul, and Ao, Q., 2020, Role of capping agents in the application of nanoparticles in biomedicine and environmental remediation: recent trends and future prospects, *J Nanobiotechnology*, 18, 172.
- Jayachandran, A., T.R., A., and Nair, A.S., 2021, Green synthesis and characterization of zinc oxide nanoparticles using Cayratia pedata leaf extract, *Biochem Biophys Rep*, 26, 100995.
- Jin, S.E. and Jin, H.E., 2019, Synthesis, characterization, and three-dimensional structure generation of zinc oxide-based nanomedicine for biomedical applications, *Pharmaceutics*, 11, 575.
- Jones, E.M., Cochrane, C.A., and Percival, S.L., 2015, The Effect of pH on the Extracellular Matrix and Biofilms, *Adv Wound Care (New Rochelle)*, 4, 431–439.
- Kader, D.A., Rashid, S.O., and Mohammed, S.J., 2023, Innovative development of hybrid nanocatalyst (ATH-ZnONPs) through green methods for achieving visible light-induced photocatalytic aerobic oxidation of benzyl alcohols into corresponding aldehydes and ketones, *Surface. Interfac.*, 43, 103599.
- Kalpana, V.N., Kataru, B.A.S., Sravani, N., Vigneshwari, T., Panneerselvam, A., and Devi Rajeswari, V., 2018, Biosynthesis of zinc oxide nanoparticles using culture filtrates of *Aspergillus niger*: Antimicrobial textiles and dye degradation studies, *OpenNano*, 3, 48–55.
- Kalra, K., Chhabra, V., and Prasad, N., 2022, Antibacterial activities of zinc oxide nanoparticles: a mini review, *J Phys Conf Ser*, 2267, 012049.
- Kandimalla, R., Kalita, S., Choudhury, B., Devi, D., Kalita, D., Kalita, K., Dash, S., and Kotoky, J., 2016, Fiber from ramie plant (*Boehmeria nivea*): A novel suture biomaterial, *Mater. Sci. Eng. C*, 62, 816–822.
- Kaur, N., Kaur, B., and Sirhindi, G., 2017, Phytochemistry and Pharmacology of *Phyllanthus niruri* L.: A Review, *Phytother Res.*, 31, 980–1004.

- Ke, G., Chowdhury, M.H., Jin, X., and Li, W., 2021, Fabrication and properties of polyaniline/ramie composite fabric based on in situ polymerization, *Polym. Polym. Compos.*, 29, 914–925.
- Khadem, E. and Kharaziha, M., 2022, Red cabbage anthocyanin- functionalized tannic acid-silver nanoparticles with pH sensitivity and antibacterial properties, *Mater Chem Phys*, 291, 126689.
- Khan, Ibrahim, Saeed, K., and Khan, Idrees, 2019, Nanoparticles: Properties, applications and toxicities, *Arab. J. Chem.*, 12, 908–931.
- khoobi, M., Moghimi, M., Motlagh, G.H., Sorouri, F., and Haririan, E., 2020, Cross-Linked Poly(acrylic acid) Hydrogel Loaded with Zinc Oxide Nanoparticles and Egg White Proteins for Antimicrobial Application, *J Inorg Organomet Polym Mater*, 30, 5234–5243.
- Kim, A.N., Lee, K.Y., Kim, B.G., Cha, S.W., Jeong, E.J., Kerr, W.L., and Choi, S.G., 2021, Thermal processing under oxygen-free condition of blueberry puree: Effect on anthocyanin, ascorbic acid, antioxidant activity, and enzyme activities, *Food Chem*, 342, 128345.
- Koshy, J.T., Vasudevan, D., Sangeetha, D., and Prabu, A.A., 2023, Biopolymer Based Multifunctional Films Loaded with Anthocyanin Rich Floral Extract and ZnO Nano Particles for Smart Packaging and Wound Healing Applications, *Polymers (Basel)*, 15, 115.
- Kosnayani, A.S., Yunianto, A.E., Rizal, M.E.A., and Meylani, V., 2022, Analysis of Phytochemical Content and Antioxidant Activity in Phyllanthus Niruri Linn. By Different Methods, *Int. J. Des. Nat. Ecodynamics.*, 17, 795–800.
- Król, A., Railean-Plugaru, V., Pomastowski, P., and Buszewski, B., 2019, Phytochemical investigation of Medicago sativa L. extract and its potential as a safe source for the synthesis of ZnO nanoparticles: The proposed mechanism of formation and antimicrobial activity, *Phytochem Lett*, 31, 170–180.
- Krysa, M., Szymańska-Chargot, M., and Zdunek, A., 2022, FT-IR and FT-Raman fingerprints of flavonoids – A review, *Food Chem*, 393, 133430.
- Kumar, V.G. V. and Prem, A.A., 2018, Green synthesis and characterization of iron oxide nanoparticles using phyllanthus niruri extract, *Orient. J. Chem.*, 34, 2583–2589.
- Kumari, N., Sudharsan, V., Muthu Kutty, T., Jayan, N., and Laxmi Deepak Bhatlu, M., 2023, Green synthesis and characterization of Zinc and Copper oxides nanocomposite using Phyllanthus emblica extracts and its antibacterial and antioxidant properties, *Mater Today Proc*, 6, 1016.
- Li, Q., Zhang, F., Wang, Z., Feng, Y., and Han, Y., 2023, Advances in the Preparation, Stability, Metabolism, and Physiological Roles of Anthocyanins: A Review, *Foods*, 12, 3969.

- Li, Y., Li, Z., Wang, Y., Sun, L., and Pei, H., 2023, Anthocyanins/chitosan films doped by nano zinc oxide for active and intelligent packaging: comparison of anthocyanins source from purple tomato or black wolfberry, *Front Chem Sci Eng*, 17, 704–715.
- Lin, Y., Li, C., Shi, L., and Wang, L., 2023, Anthocyanins: Modified New Technologies and Challenges, *Foods*, 12, 1368.
- Liu, D., Cui, Z., Shang, M., and Zhong, Y., 2021, A colorimetric film based on polyvinyl alcohol/sodium carboxymethyl cellulose incorporated with red cabbage anthocyanin for monitoring pork freshness, *Food Packag Shelf Life*, 28, 100641.
- Liu, J., Huang, J., Ying, Y., Hu, L., and Hu, Y., 2021, pH-sensitive and antibacterial films developed by incorporating anthocyanins extracted from purple potato or roselle into chitosan/polyvinyl alcohol/nano-ZnO matrix: Comparative study, *Int J Biol Macromol*, 178, 104–112.
- Lotfinia, F., Norouzi, M.R., Ghasemi-Mobarakeh, L., and Naeimirad, M., 2023, Anthocyanin/Honey-Incorporated Alginate Hydrogel as a Bio-Based pH-Responsive/Antibacterial/Antioxidant Wound Dressing, *J Funct Biomater*, 14, 72.
- De Lucas-Gil, E., Leret, P., Monte-Serrano, M., Reinoso, J.J., Enríquez, E., Del Campo, A., Cañete, M., Menéndez, J., Fernández, J.F., and Rubio-Marcos, F., 2018, ZnO Nanoporous Spheres with Broad-Spectrum Antimicrobial Activity by Physicochemical Interactions, *ACS Appl Nano Mater*, 1, 3214–3225.
- Luna-Vital, D., Cortez, R., Ongkowijoyo, P., and Gonzalez de Mejia, E., 2018, Protection of color and chemical degradation of anthocyanin from purple corn (*Zea mays* L.) by zinc ions and alginate through chemical interaction in a beverage model, *Food Res. Int.*, 105, 169–177.
- Mahendra, C., Murali, M., Manasa, G., Ponnammam, P., Abhilash, M.R., Lakshmeesha, T.R., Satish, A., Amruthesh, K.N., and Sudarshana, M.S., 2017, Antibacterial and antimutagenic potential of bio-fabricated zinc oxide nanoparticles of *Cochlospermum religiosum* (L.), *Microb Pathog*, 110, 620–629.
- Mary, S.K., Koshy, R.R., Daniel, J., Koshy, J.T., Pothen, L.A., and Thomas, S., 2020, Development of starch based intelligent films by incorporating anthocyanins of butterfly pea flower and TiO₂ and their applicability as freshness sensors for prawns during storage, *RSC Adv*, 10, 39822–39830.
- Maryani, F., Filaila, E., and Krismastuti, F., 2024, Comparative studies on chemically synthesized and biosynthesized zinc oxide nanoparticles using *Desmodium* sp. and their potential as UV filters, *IOP Conf Ser Earth Environ Sci*, 1312, 012022.

- Mohapatra, P., Sharma, A., and Dixit, Y., 2020, A Review On Phyto Chemicals and Medicinal Properties of Bombax and Phyllanthus Species, *Int. J. Eng. Appl. Sci. Technol.*, 5, 522–530.
- Mulchandani, N. and Karnad, V., 2022, Application of zinc oxide nano particles using polymeric binders on cotton fabric, *Res. J. Text. Appar.*, 26, 310–322.
- Murthy, H.N., Joseph, K.S., Paek, K.Y., and Park, S.Y., 2024, Anthocyanin Production from Plant Cell and Organ Cultures In Vitro, *Plants*, 13, 117.
- Mutukwa, D., Taziwa, R., and Khotseng, L.E., 2022, A Review of the Green Synthesis of ZnO Nanoparticles Utilising Southern African Indigenous Medicinal Plants, *Nanomaterials*, 12, 3456.
- Nguang, S.L., Yeong, Y.L., Pang, S.F., and Gimbin, J., 2018, Optimisation of Gallic Acid and Quercetin Extraction from Phyllanthus Niruri, *Int. J. Eng. Technol.*, 7, 90–94.
- Nhi, T.T., Minh, H.H., Nam, T.M.P., Thien, D.B.T., Hoai, N.T.T., Phuoc, T. Van, Thai, D.M., Hai, N.D., Toi, V. Van, and Hiep, N.T., 2018, Optimization and characterization of electrospun polycaprolactone coated with gelatin-silver nanoparticles for wound healing application, *Mater. Sci. Eng. C.*, 91, 318–329.
- Niranjan, R., Kaushik, M., Prakash, J., Venkataprasanna, K.S., Prema, D., Christy, A., Pannerselvam, B., and Devanand Venkatasubbu, G., 2023, Chitosan based wound dressing patch loaded with curcumin tagged ZnO nanoparticles for potential wound healing application, *Inorg Chem Commun.*, 154, 110885.
- Nishikiori, H., Natori, D., Ebara, H., Teshima, K., and Fujii, T., 2016, Zinc complex formation of organic ligands on zinc oxide and titanium dioxide, *J Photochem Photobiol A Chem*, 327, 51–57.
- Nivetha, A., Sakthivel, C., Rajagopal, G., Nandhabala, S., Hemalatha, J., Senthamil, C., and Prabha, I., 2022, A novel approach of phyllanthus niruri supported Ag-Cu-Co for anti-oxidant, anti-bacterial, larvicidal and photodegradation applications, *Surf. Interfaces*, 35, 102388.
- Noorjahan, C.M., 2019, Green Synthesis, Characterization, and Antibacterial Activity of Zinc Oxide Nanoparticle, *Asian J. Pharm. Clin. Res.*, 12, 106–110.
- Nurtiana, W., 2019, Anthocyanin as Natural Colorant: A Review, *Food ScienTech J.*, 1, 1.
- Oliveira Filho, J.G. de, Braga, A.R.C., Oliveira, B.R. de, Gomes, F.P., Moreira, V.L., Pereira, V.A.C., and Egea, M.B., 2021, The potential of anthocyanins in smart, active, and bioactive eco-friendly polymer-based films: A review, *Food Res. Int.*, 142, 110202.

- Ouzakar, S., Skali Senhaji, N., Saidi, M.Z., El Hadri, M., El Baaboua, A., El Harsal, A., and Abrini, J., 2023, Antibacterial and antifungal activity of zinc oxide nanoparticles produced by *Phaeodactylum tricornutum* culture supernatants and their potential application to extend the shelf life of sweet cherry (*Prunus avium* L.), *Biocatal Agric Biotechnol*, 49, 102666.
- Pang, Q., Yang, F., Jiang, Z., Wu, K., Hou, R., and Zhu, Y., 2023, Smart wound dressing for advanced wound management: Real-time monitoring and on-demand treatment, *Mater Des*, 229, 111917.
- Pereira, P.F.M., Picciani, P.H. de S., Calado, V., and Tonon, R. V., 2022, Anthocyanin-sensitized gelatin-ZnO nanocomposite based film for meat quality assessment, *Food Chem*, 372, 131228.
- Popescu, M. and Ungureanu, C., 2023, Green Nanomaterials for Smart Textiles Dedicated to Environmental and Biomedical Applications, *Materials*, 16, 4075–4102.
- Praseptianga, D., Zahara, H.L., Widjanarko, P.I., Joni, I.M., and Panatarani, C., 2020, Preparation and FTIR spectroscopic studies of SiO₂-ZnO nanoparticles suspension for the development of carrageenan-based bio-nanocomposite film., In, *AIP Conf. Proc.*, p. 100005.
- Prietto, L., Mirapalhete, T.C., Pinto, V.Z., Hoffmann, J.F., Vanier, N.L., Lim, L.-T., Guerra Dias, A.R., and da Rosa Zavareze, E., 2017, pH-sensitive films containing anthocyanins extracted from black bean seed coat and red cabbage, *LWT*, 80, 492–500.
- Qu, J., Zhao, X., Liang, Y., Zhang, T., Ma, P.X., and Guo, B., 2018, Antibacterial adhesive injectable hydrogels with rapid self-healing, extensibility and compressibility as wound dressing for joints skin wound healing, *Biomaterials*, 183, 185–199.
- Raghunath, A. and Perumal, E., 2017, Metal oxide nanoparticles as antimicrobial agents: a promise for the future, *Int J Antimicrob Agents*, 49, 137–152.
- Rahman, F., Majed Patwary, M.A., Bakar Siddique, M.A., Bashar, M.S., Haque, Md Aminul, Akter, B., Rashid, R., Haque, Md Anamul, and Royhan Uddin, A.K.M., 2022, Green synthesis of zinc oxide nanoparticles using *Cocos nucifera* leaf extract: characterization, antimicrobial, antioxidant and photocatalytic activity, *R Soc Open Sci*, 9, 220858.
- Raji, M., El Foujji, L., Mekhzoum, M.E.M., El Achaby, M., Essabir, H., Bouhfid, R., and Qaiss, A. el kacem, 2022, pH-indicative Films Based on Chitosan–PVA/Sepiolite and Anthocyanin from Red Cabbage: Application in Milk Packaging, *J Bionic Eng*, 19, 837–851.
- Rakić, V., Rinnan, Å., Polak, T., Skrt, M., Miljković, M., and Ulrih, N.P., 2019, pH-induced structural forms of cyanidin and cyanidin 3-O-β-glucopyranoside, *Dyes and Pigments*, 165, 71–80.

- Ramesh, P., Rajendran, A., and Ashokkumar, M., 2022, Biosynthesis of zinc oxide nanoparticles from Phyllanthus Niruri plant extract for photocatalytic and antioxidant activities, *Int J Environ Anal Chem*, 1–12.
- Ramesh, P. and Saravanan, K., 2018, Green Synthesis, Characterization, Antimicrobial and Food Packaging of Biocompatible Zinc Oxide Nanoparticles, *Asian J. Res. Pharm. Sci. Biotechnol.*, 6, 76–86.
- Ramya, V., Kalaiselvi, V., Kannan, S.K., Shkir, M., Ghramh, H.A., Ahmad, Z., Nithiya, P., and Vidhya, N., 2022, Facile Synthesis and Characterization of Zinc Oxide Nanoparticles Using Psidium guajava leaf Extract and Their Antibacterial Applications, *Arab J Sci Eng*, 47, 909–918.
- Retnowati, A., Rugayah, J.S.R., and Arifiani, D., 2019, Status keanekaragaman hayati Indonesia : kekayaan jenis tumbuhan dan jamur Indonesia, LIPI Press, Jakarta.
- Risnawati, R., Muharram, M., and Jusniar, J., 2021, Isolasi dan Identifikasi Senyawa Metabolit Sekunder Ekstrak n-heksana Tumbuhan Meniran (Phyllanthus niruri Linn.), *J. Ilm. Kim. dan Pendidik. Kim.*, 22, 65.
- Roy, S. and Rhim, J.W., 2021, Anthocyanin food colorant and its application in pH-responsive color change indicator films, *Crit Rev Food Sci Nutr*, 61, 2297–2325.
- Salnus, S., Wahab, W., Arfah, R., Zenta, F., Natsir, H., Muriyati, M., Fatimah, F., Rajab, A., Armah, Z., and Irfandi, R., 2022, A Review on Green Synthesis, Antimicrobial Applications and Toxicity of Silver Nanoparticles Mediated by Plant Extract, *Indones. J. Chem.*, 22, 1129–1143.
- Saputra, I.S., Suhartati, S., Yulizar, Y., and Sudirman, S., 2020, Green Synthesis Nanopartikel ZnO Menggunakan Media Ekstrak Daun Tin (Ficus carica Linn), *J. Kim. Kemasan*, 42, 1–6.
- Saravanadevi, K., Kavitha, M., Karpagavinayagam, P., Saminathan, K., and Vedhi, C., 2019, Biosynthesis of ZnO and Ag doped ZnO nanoparticles from Vitis vinifera leaf for antibacterial, photocatalytic application,. In, *Mater. Today-Proc.* Elsevier Ltd, pp. 352–356.
- Sari, R.N., Nurhasni, N., and Yaqin, M.A., 2017, Green Synthesis Nanoparticle ZnO Sargassum sp. Extract and The Products Characteristic, *J Pengolah Has Perikan Indones*, 20, 238.
- Sarkar, D. and Rakshit, A., 2017, Red cabbage as potential functional food in the present perspective, *Int. J. Bioresour. Sci.* , 4, 7–8.
- Sendri, N., Singh, S., Bhatt, S., Gupta, M., and Bhandari, P., 2023, Insight into the influence of oxygen, sunlight and temperature on the stability and color attributes of red cabbage anthocyanins and in vitro gastrointestinal behaviour, *Food Chem. Adv.* , 3, 100359.

- Shafique, S., Jabeen, N., Ahmad, K.S., Irum, S., Anwaar, S., Ahmad, N., Alam, S., Ilyas, M., Khan, T.F., and Hussain, S.Z., 2020, Green fabricated zinc oxide nanoformulated media enhanced callus induction and regeneration dynamics of *Panicum virgatum* L., *PLoS One*, 15, e0230464.
- Shimi, A.K., Wabaidur, S.M., Siddiqui, M.R., Islam, M.A., Rane, K.P., and Jeevan, T.S.A., 2022, Photocatalytic Activity of Green Construction TiO₂ Nanoparticles from *Phyllanthus niruri* Leaf Extract, *J Nanomater*, 2022, 7011539.
- Sirelkhatim, A., Mahmud, S., Seenii, A., Kaus, N.H.M., Ann, L.C., Bakhori, S.K.M., Hasan, H., and Mohamad, D., 2015, Review on Zinc Oxide Nanoparticles: Antibacterial Activity and Toxicity Mechanism, *Nanomicro Lett*, 7, 219–242.
- Soesanto, L., 2021, DAHSYATNYA MENIRAN HIJAU: Gempur Berbagai Penyakit dan sebagai Anti-Virus, 1st ed. Mayasari, L. (ed) Lily Publisher, Yogyakarta.
- Soltaninejad, V., Ahghari, M.R., Taheri-Ledari, R., and Maleki, A., 2021, Bifunctional PVA/ZnO/AgI/Chlorophyll Nanocomposite Film: Enhanced Photocatalytic Activity for Degradation of Pollutants and Antimicrobial Property under Visible-Light Irradiation, *Langmuir*, 37, 4700–4713.
- Song, H.N., Ji, S.A., Park, H.R., Kim, H.H., and Hogstrand, C., 2018, Impact of various factors on color stability of fresh blueberry juice during storage, *Prev Nutr Food Sci*, 23, 46–51.
- Stoica, R., Ganciarov, M., Constantinescu-Aruxandei, D., Capră, L., Șuică-Bunghiez, I.-R., Senin, R.-M., Pricope, G.D., Ivan, G.-R., Călin, C., and Oancea, F., 2023, Sustainable Recovery of Anthocyanins and Other Polyphenols from Red Cabbage Byproducts, *Foods*, 12, 4157.
- Sugiarto, J., Fatmasari, Z.T., Lestari, S.P., and Purwono, B., 2022, Chemosensor Strip from Kepok Banana Bracts Extract (*Musa paradisiaca* L.) for Detection of Tuna Freshness, *J. Kim. Sains dan Apl.*, 25, 108–115.
- Sukumaran, D.P. and Abdulla, M.H., 2023, Can bio-nanotechnology be effective against multi drug resistant (MDR) pathogens?.. In, *Appl. Multifunc. Nanomater*. Elsevier, pp. 475–498.
- Sun, L., Han, J., Liu, Z., Wei, S., Su, X., and Zhang, G., 2019, The facile fabrication of wound compatible anti-microbial nanoparticles encapsulated Collagenous Chitosan matrices for effective inhibition of poly-microbial infections and wound repairing in burn injury care: Exhaustive in vivo evaluations, *J Photochem Photobiol B*, 197, 111539.
- Sun, W. and Shahrajabian, M.H., 2023, Therapeutic Potential of Phenolic Compounds in Medicinal Plants—Natural Health Products for Human Health, *Molecules*, 28, 1845.

- Szultka-Młyńska, M., Janiszewska, D., Pomastowski, P., Złoch, M., Kupczyk, W., and Buszewski, B., 2021, Identification of Bacteria Associated with Post-Operative Wounds of Patients with the Use of Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry Approach, *Molecules*, 26, 5007.
- Tan, S., Lan, X., Chen, S., Zhong, X., and Li, W., 2023, Physical character, total polyphenols, anthocyanin profile and antioxidant activity of red cabbage as affected by five processing methods, *Food Res. Int.*, 169, 112929.
- T-Thienprasert, N.P., T-Thienprasert, J., Ruangtong, J., Jaithon, T., Srifah Huehne, P., and Piasai, O., 2021, Large Scale Synthesis of Green Synthesized Zinc Oxide Nanoparticles from Banana Peel Extracts and Their Inhibitory Effects against Colletotrichum sp., Isolate KUFC 021, Causal Agent of Anthracnose on Dendrobium Orchid, *J Nanomater.*, 1–10.
- Wei, C., Xiong, S., Zhang, S., Cui, Y., Wang, S., Lu, X., Chen, J., Zhang, M., and Yang, B., 2023, A study on the biocompatibility of ramie fibre for medical dressing application, *Biosurf Biotribol*, 9, 169–175.
- Wulandari, A.P., Karlina, E., Tanudjaja, E., Rohmat, A., Kusmoro, J., Fadhlillah, M., Somantri, K., Sahroni, R., and Fatriasari, W., 2024, Characteristics and Quality of Flame-Retarded Ramie Fabrics for the Development of Functional Textiles, *Materials*, 17, 1416.
- Xu, H., Shi, Y., Gao, L., Shi, N., Yang, J., and Hao, R., 2023, Preparation and characterization of pH-responsive polyvinyl alcohol/chitosan/ anthocyanin films, *Food Sci. Technol.*, 43, 98022–98034.
- Xu, J., Huang, Y., Zhu, S., Abbes, N., Jing, X., and Zhang, L., 2021, A review of the green synthesis of ZnO nanoparticles using plant extracts and their prospects for application in antibacterial textiles, *J Eng Fiber Fabr*, 16, 1–14.
- Yang, X., Yang, J., Wang, L., Ran, B., Jia, Y., Zhang, L., Yang, G., Shao, H., and Jiang, X., 2017, Pharmaceutical Intermediate-Modified Gold Nanoparticles: Against Multidrug-Resistant Bacteria and Wound-Healing Application via an Electrospun Scaffold, *ACS Nano*, 11, 5737–5745.
- Yong, S.X.M., Song, C.P., and Choo, W.S., 2021, Impact of High-Pressure Homogenization on the Extractability and Stability of Phytochemicals, *Front Sustain Food Syst*, 4, 593259.
- Youssef, F., Ismail, S., Fouad, O., and Mohamed, G., 2024, Green synthesis and Biomedical Applications of Zinc Oxide Nanoparticles. Review, *Egypt. J. Vet. Sci.*, 55, 287–311.
- Yusof, H.M., Mohamad, R., Zaidan, U.H., and Rahman, N.A.A., 2019, Microbial synthesis of zinc oxide nanoparticles and their potential application as an antimicrobial agent and a feed supplement in animal industry: A review, *J Anim Sci Biotechnol*, 10, 1–22.

- Zackiyah, 2016, Spektrometri Ultra Violet atau Sinar Tampak (UV-Vis),. In, *Kimia Analitik Instrumen*. Universitas Terbuka, Tangerang Selatan, pp. 1–46.
- Zain, S.N.D.M. and Omar, W.A.W., 2018, Antioxidant activity, total phenolic content and total flavonoid content of water and methanol extracts of phyllanthus species from Malaysia, *Pharmacogn J*, 10, 677–681.
- Zhao, Y.W., Wang, C.K., Huang, X.Y., and Hu, D.G., 2021, Anthocyanin stability and degradation in plants, *Plant Signal Behav*, 16, 1987767.
- Zheng, T., Tang, P., and Li, G., 2023, Development of a pH-sensitive film based on collagen/chitosan/ZnO nanoparticles and mulberry extract for pork freshness monitoring, *Food Chem*, 402, 134428.
- Zhou, X.Q., Hayat, Z., Zhang, D.D., Li, M.Y., Hu, S., Wu, Q., Cao, Y.F., and Yuan, Y., 2023, Zinc Oxide Nanoparticles: Synthesis, Characterization, Modification, and Applications in Food and Agriculture, *Processes*, 11, 1193.