



DAFTAR PUSTAKA

- Aguilar-Llanos, E., Romero-Benavides, J.C., and Heredia-Moya, J., 2022, Synthesis of 4-Arylallylideneypyrazolone Derivatives, *Chem. Proc.*, 8(1), 1-8.
- Ahmad, A., Husain, A., Khan, S.A., Mujeeb, M., and Bhandari, A., 2016, Synthesis, Antimicrobial and Antitubercular Activities of Some Novel Pyrazoline Derivatives, *Journal of Saudi Chemical Society*, 20(5), 577-584.
- Aksöz, B.E., Gurpinar, S.S., and Eryilmaz, M., 2020, Antimicrobial Activities of Some Pyrazoline and Hydrazone Derivatives, *Turk J Pharm Sci*, 17(5), 500-505.
- Al-Ayed, A.S., 2011, Synthesis, Spectroscopy and Electrochemistry of New 3-(5-Aryl-4,5-Dihydro-1H-Pyrazol-3-yl)-4-Hydroxy-2H-Chromene-2-One 4, 5 as a Novel Class of Potential Antibacterial and Antioxidant Derivatives, *IJOC*, 1(3), 87-89.
- Anjali, S., Sangeetha, M., Nithya, M., Krishnan, G.V., Varughese, S., Kumar, B.S.D., Srikanthamurthy, N., Shridevi, D., and Somappa, S.B., 2023. Pyrazole Appended Hetero-hybrids: Bioisosteric Design, Synthesis, *In Silico* and *In Vitro* Antibacterial and Anti-Inflammatory Evaluations, *J. Mol. Struc.*, 1289, 135780.
- Balouiri, M., Sadiki, M., and Ibsouda, S.K., 2016, Methods for *In Vitro* Evaluating Antimicrobial Activity: A Review, *J. Pharm. Anal.*, 6(2), 71-79.
- Breitmaier, E., 2022, *Structure Elucidation by NMR in Organic Chemistry*, Third edition, John Wiley and Sons, New Jersey.
- Brvar, M., Perdih, A., Renko, M., Anderluh, G., Turk, D., and Solmajer, T., 2012, Structure-Based Discovery of substituted 4,5'-bithiazoles as Novel DNA Gyrase Inhibitors, *J. Med. Chem.*, 55(14), 6413–6426.
- Choi, D., Park, J.C., Lee, H.N., Moon, J.H., Ahn, H.K., Park, K., and Hong, J., 2018, *In Vitro* Osteogenic Differentiation and Antibacterial Potentials of Chalcone Derivatives, *Mol. Pharm*, 15(8), 3197-3204.
- Davis, W.W. and Stout, T.R., 1971, Disc Plate Method of Microbiological Antibiotic Assay, *Appl Microbiol.*, 22(4), 659-665.
- Dawame, B.S., Vibhute, Y.B., Konda, S.G., and Mali, M.R., 2008, Synthesis of Some New 3-(Substituted phenyl)-5-(9-anthryl)- 2-pyrazolines, 1-Phenyl-3-(substituted phenyl)-5-(9-anthryl)- 2-pyrazolines and 2-(9-Anthryl)-4-(substituted phenyl)-1,5- benzothiazepines as Antibacterial Agents, *Asian Journal of Chemistry*, 20(6), 4199-4204.
- Detsi, A., Majdalani, M., Kontogiorgis, C.A., Hadjipavlou-Litina, D., and Kefalas, P., 2009, Natural and Synthetic 2'-hydroxy-chalcones and Aurones: Synthesis, Characterization and Evaluation of the Antioxidant and Soybean Lipoxygenase Inhibitory Activity, *Bioorg. Med. Chem.*, 17(23), 8073–8085.



- Durcik, M., Skok, Z., Ilaš, J., Zidar, N., Zega, A., Szili, P.E., Draskovits, G., Révész, T., Kikelj, D., Nyerges, A., Pál, C., Mašic, L.P., and Tomašic, T., 2020, Hybrid Inhibitors of DNA Gyrase A and B: Design, Synthesis and Evaluation, *Pharmeutics*, 13(1), 1-17.
- Durgapal, S.D., Soni, R., Umar, S., Suresh, B., and Soman, S.S., 2018, 3-Aminomethyl Pyridine Chalcone Derivatives: Design, Synthesis, DNA Binding and Cytotoxic Studies, *Chem. Biol. Drug Des.*, 92(1), 1279–1287.
- Eakin, A.E., Green, O., Hales, N., Walkup, G.K., Bist, S., Singh, A., Mullen, G., Bryant, J., Embrey, K., Gao, N., Breeze, A., Timms, D., Andrews, B., Urias-Nickelsen, M., Demeritt, J., Loch, J.T., Hull, K., Blodgett, A., Illingworth, R. N., and Sherer, B., 2012, Pyrrolamide DNA Gyrase Inhibitors: Fragment-based Nuclear Magnetic Resonance Screening to Identify Antibacterial Agents, *Antimicrob Agents Chemother.*, 56(3), 1240–1246.
- Elseginy, S.A., dan Anwar, M.M., 2022, Pharmacophore-Based Virtual Screening and Molecular Dynamics Simulation for Identification of a Novel DNA Gyrase B Inhibitor with Benzoxazine Acetamide Scaffold, *ACS Omega*, 7(1), 1150–1164.
- Gilfillan, L., Artschwager, R., Harkiss, A.H., Liskamp, R.M., and Sutherland, A., 2015, Synthesis of Pyrazole Containing α -amino Acids Via a Highly Regioselective Condensation/aza-Michael Reaction of β -aryl α , β -unsaturated ketones, *Org. Biomol. Chem.*, 13(15), 4514-4523.
- Gómez-Rivera, A., Aguilar-Mariscal, H., Romero-Ceronio, N., Roa-De La Fuente, L. F., and Lobato-García, C.E., 2013, Synthesis and Anti-Inflammatory Activity of Three Nitro Chalcones, *Bioorg Med Chem Lett.*, 23(20), 5519–5522.
- Gonzalez-Pastor, R., Carrera-Pacheco, S.E., Zúñiga-Miranda, J., Rodríguez-Pólit, C., Mayorga-Ramos, A., Guamán, L.P., and Barba-Ostria, C., 2023, Current Landscape of Methods to Evaluate Antimicrobial Activity of Natural Extracts, *Molecules*, 28(3), 1068.
- Gravet, A., Couppié, P., Meunier, O., Clyti, E., Moreau, B., Pradinaud, R., Monteil, H., and Priévest, G., 2001, Staphylococcus aureus Isolated in Cases of Impetigo Produces Both Epidermolyisin A or B and lukE-lukD in 78% of 131 Retrospective and Prospective Cases, *J. Clin. Microbiol.*, 39(12), 4349–4356.
- Haider, K., Shafeequ, M., Yahya, S., and Yar, M. S., 2022, A Comprehensive Review on Pyrazoline Based Heterocyclic Hybrids as Potent Anticancer Agents, *EJMCR*, 5, 100042.
- Hilma, R., Jasril, S.H.S., dan Permana, I., 2015, Aktivitas Antidiabetes Senyawa Analog Kalkon dan Turunan Kalkon (Subtituen Naftalen) terhadap Enzim α -Glukosidase, *Semirata*, 180-189.
- Hutchings, M., Truman, A., and Wilkinson, B., 2019, Antibiotics: Past, Present and Future, *Curr. Opin. Microbiol.*, 51, 72–80.



- Islam, M.S., Al-Majid, A.M., Sholkamy, E.N., Yousuf, S., Ayaz, M., Nawaz, A., Wadood, A., Rehman, A.U., Verma, V.P., Bari, A., Haukka, M., Soliman, S. M., and Barakat, A., 2022, Synthesis, Molecular Docking and Enzyme Inhibitory Approaches of Some New Chalcones Engrafted Pyrazole as Potential Antialzheimer, Antidiabetic and Antioxidant Agents, *J. Mol. Struct.*, 1269, 133843.
- Karrouchi, K., Radi, S., Ramli, Y., Taoufik, J., Mabkhot, Y.N., Al-Aizari, F.A., and Ansar, M.H., 2018, Synthesis and Pharmacological Activities of Pyrazole Derivatives: A review, *Molecules*, 23(1), 134.
- Kumar, V., Kaur, K., Gupta, G.K., and Sharma, A.K., 2013, Pyrazole Containing Natural Products: Synthetic Preview and Biological Significance, *Eur. J. Med. Chem.*, 69, 735-753.
- Lestari, E., Matsjeh, S., dan Swasono, R.T., 2018, Sintesis Senyawa Turunan Khalkon dan Flavon Berbahan Dasar Vanilin dan Uji Sitotoksik Terhadap Sel Kanker Serviks (Hela), Sel Kanker Kolon (Widr), dan Sel Kanker Payudara (T47D) Secara *In Vitro*, *BIMIPA*, 53-65.
- Lagu, S.B., Yejella, R.P., Bhandare, R.R., dan Shaik, A.B., 2020, Design, Synthesis, and Antibacterial and Antifungal Activities of Novel Trifluoromethyl and Trifluoromethoxy Substituted Chalcone Derivatives, *Pharmaceuticals (Basel)*, 13(11), 375.
- Li, T., Wang, Z., Guo, J., de la Fuente-Nunez, C., Wang, J., Han, B., Tao, H., Liu, J., and Wang, X., 2023, Bacterial Resistance to Antibacterial Agents: Mechanisms, Control Strategies, and Implications for Global Health, *Sci. Total Environ.*, 860, 160461.
- Lindahl, J.F., and Grace, D., 2015, The Consequences of Human Actions on Risks for Infectious Diseases: A Review, *Infect. Ecol. Epidemiol.*, 5(1), 30048.
- Lobanovska, M., and Pilla, G., 2017, Focus: Drug Development: Penicillin's Discovery and Antibiotic Resistance: Lessons for The Future?, *Yale J. Biol. Med.*, 90(1), 135-134.
- Matiadis, D., 2023, Strategies and Methods for the Synthesis of 2-Pyrazolines: Recent Developments (2012–2022), *Adv. Synth. Catal.*, 365(12): 1934-1969.
- Mendes, C.D.D.S., and Antunes, A.M.D.S., 2013, Pipeline of Known Chemical Classes of Antibiotics, *Antibiotics*, 2(4), 500–534.
- McMurtry, J., 2016, *Organic Chemistry*, 9th Ed., Cengage Learning, Boston.
- Miklasińska-Majdanik, M., Kępa, M., Wojtyczka, R.D., Idzik, D., and Wąsik, T.J., 2018, Phenolic Compounds Diminish Antibiotic Resistance of *Staphylococcus Aureus* Clinical Strains, *Int J Environ Res Public Health.*, 15(10), 2321.
- Nadapdap, L.D.B., 2016, Sintesis Dan Uji Antibakteri Senyawa Turunan 4'-Hidroksikalkon dan Pirazolina dari Senyawa Turunan Benzaldehida, *Tesis*, Departemen Kimia FMIPA UGM, Yogyakarta.



- Oktaviani, R., Arifian, H., Ramadani, A., Zamruddin, N. M., dan Rusli, R., 2019, Kajian In Silico Senyawa Turunan Kalkon sebagai Antikanker, *Proceeding of the 9th Mulawarman Pharmaceuticals Conferences*, 22-26.
- Parlett, R.C., 1951, Studies of Induced Resistance of Certain Bacteria to Several Plant Extracts, *Tesis*, Universitas Arizona, Tucson.
- Patan, A., Kella, A., and Aanandhi, M.V., 2018, Synthesis, Characterization, and Biological Evaluation of Some New Quinolinyl Chalcone Derivatives, *Drug Invent. Today*, 10(3), 268-271.
- Pham, P., Oliver, S., Wong, E.H.H., and Boyer, C., 2021, Effect of Hydrophilic Groups on The Bioactivity of Antimicrobial Polymers, *Polym. Chem.*, 12(39), 5689-5703.
- Pratama, A.A., Rifai, Y., dan Marzuki, A., 2017, Docking Molekuler Senyawa 5,5'-dibromometilsesamin, *MFF*, 21(3), 67-69.
- Priastomo, Y., 2014, Sintesis dan Uji In-Vitro Antibakteri Senyawa N-Fenil Pirazolina dari Benzaldehida dan Vanilin dengan Asetofenon, *Skripsi*, Departemen Kimia FMIPA UGM, Yogyakarta.
- Ramana, P.V., Sundius, T., Muthu, S., Mouli, K.C., Krishna, Y.R., Prasad, K.V., Devi, R.N., Irfan, A., and Santhamma, C., 2022, Spectroscopic, Quantum Mechanical, Electronic Excitation Properties (Ethanol Solvent), DFT Investigations and Molecular Docking Analysis of An Anti-Cancer Drug Bendamustine, *J Mol Struct*, 1253, 132211.
- Rana, M., Arif, R., Khan, F.I., Maurya, V., Singh, R., Faizan, M.I., Yasmeen, S., Dar., S.H., Alam, R., Sahu, A., Ahmad, T., and Rahisuddin, 2021, Pyrazoline Analogs as Potential Anticancer Agents and Their Apoptosis, Molecular Docking, MD Simulation, DNA Binding and Antioxidant Studies, *Bioorg Chem*, 108, 104665.
- Ramkumar, V., Raorane, C.J., Christy, H.J., Anandhi, S., Santhamoorthy, M., Kamachiappan, P., Ashokkumar, A., Balamurugan, S., and Kim, S.C., Hydrogen-Bonded Keto-Enol Mechanized Chalcone Material for Optical and Antibiofilm Applications, *J Mol Struct*, 1292(15), 136109.
- Rammohan, A., Bhaskar, B.V., Venkateswarlu, N., Gu, W., and Zyryanov, G.V., 2020, Design, Synthesis, Docking and Biological Evaluation of Chalcones as Promising Antidiabetic Agents, *Bioorg. Chem.*, 95, 103527.
- Reygaert, W.C., 2018, An Overview of The Antimicrobial Resistance Mechanisms of Bacteria. *AIMS microbiol.*, 4(3), 482-501.
- Ryu, S.R., Noda, I., and Jung, Y.M., 2010, What is The Origin of Positional Fluctuation of Spectral Features: True Frequency Shift or Relative Intensity Changes of Two Overlapped Bands?, *Appl. Spectrosc.*, 64(9), 1017-1021.
- Shalas, A.F., Winarsih, S., Ihsan, B.R.P., Kharismawati, A., Firdaus, A.I., Wiloka, E., 2023, Molecular Docking, Synthesis, and Antibacterial Activity of The Analogs of 1-allyl-3-benzoylthiourea, *Res Pharm Sci*, 18(4), 371-380.



- Sekhi, R.J., 2022, Diarrhea in Children and Infants Caused by E.Coli: A Review Article, *EJRDS*, 3(2), 89–92.
- Silhavy, T.J., Kahne, D., and Walker, S., 2010, The Bacterial Cell Envelope, *Cold Spring Harb Perspect Biol.*, 2(5), a000414.
- Suirta, I.W., 2016, Sintesis Senyawa Kalkon serta Uji Aktivitas sebagai Antioksidan, *Jurnal Kimia*, 75-80.
- Suma, A.A.T., Wahyuningsih, T.D., and Mustafa., 2019, Synthesis, Cytotoxicity Evaluation and Molecular Docking Study of N-phenylpyrazoline Derivatives, *Indones. J. Chem.*, 19(4), 1081–1090.
- Sun, J., and Zhou, Y., 2015, Synthesis and Antifungal Activity of The Derivatives of Novel Pyrazole Carboxamide and Isoxazolol Pyrazole Carboxylate, *Molecules*, 20(3), 4383-4394.
- Suwito, H., Jumina, Mustafa, Ni'matzahroh, and Puspaningsih, N.N.T., 2015, Anticancer and Antimicrobial Activity of Methoxy Amino Chalcone Derivatives, *Der Pharma Chemica*, 7(3), 89–94.
- Teneva-Angelova, T., and Beshkova, D., 2015, Resistance Profile of Plant-Derived Lactic Acid Bacteria Against Herb Extracts, *Scientific Bulletin Series F Biotechnologies.*, 19, 109-116.
- Tsukiyama, R.I., Katsura, H., Tokuriki, N., and Kobayashi, M., 2002, Antibacterial Activity of Licochalcone A Against Spore-Forming Bacteria, *Antimicrob Agents Chemother.*, 46(5), 1226-1230.
- Uddin, M.N., Ahmed, S.S., Uzzaman, M., Knock, M.N.H., Shumi, W., Sanaullah, A.F.Md., and Bhuyain, M.M.H., 2022, Characterization, Molecular Modeling and Pharmacology of Some 2-hydroxychalcone Derivatives as SARS-CoV-2 Inhibitor, *Results in Chemistry*, 4, 100329.
- Veronica, E., Suyantari, S.A.A., Swari, W.D., Purwaningrum, N.M.A., Satyarsa, A. B.S., Jawi, I.M., and Sudarsa, P.S., Effectiveness of Antibacterial Extract of Kenop (*Gomphrena Globosa*) Flower Extract Against Growth of *Propionibacterium Acnes* Bacteria, *Indonesian Journal of Health Sciences*, 4(2), 115-120.
- Volk, W.A., and Wheeler, M.F., 1993, *Basic Microbiology*, 6th Ed., Harper and Row, New York.
- Wang, S., Li, C., Zhang, L., Sun, B., Cui, Y., and Sang, F., 2023, Isolation and Biological Activity of Natural Chalcones Based on Antibacterial Mechanism Classification, *Bioorg. Med. Chem.*, 93, 1-17.
- Wijayanti, L.W., Swasono, R.T., Lee, W., and Jumina, J., 2021, Synthesis and Evaluation of Chalcone Derivatives as Novel Sunscreen Agent, *Molecules*, 26(9), 2698.



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Wiratama, M., Waskhita, S.S.W., Haryadi, W., and Wahyuningsih, T.D., 2022,
Synthesis, Antimalarial Activity Assay and Molecular Docking Study of N-
Substituted Chloro-Pyrazolines, *Trop J Pharm Res*, 21(6), 1255-1261.

Xu, W., Pan, Y., Wang, H., Li, H., Peng, Q., Wei, D., Chen, C., and Zheng, J.,
Synthesis and Evaluation of New Pyrazoline Derivatives as Potential
Anticancer Agents in HepG-2 Cell Line, *Molecules*, 22, 467.

Yamali, C., Gul, H.I., Ozgun, D.O., Sakagam, H., Umemura, N., Kazaz, C., Gul,
M., 2017, Synthesis and Cytotoxic Activities of Difluoro-Dimethoxy
Chalcones, *Anticancer Agents Med Chem*, 17(10),1426-1433