

DAFTAR PUSTAKA

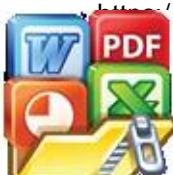
- Aditya S., and Rattan A., 2013. Vismodegib: A smoothed inhibitor for the treatment of advanced basal cell carcinoma. Indian dermatology online journal. 4 (4), 365-368.
- Amin, M.L., 2013. P-glycoprotein Inhibition for optimal drug delivery. Drug target insights. 7, 27–34. <https://doi.org/10.4137/DTI.S12519>
- Arba M., 2019. Buku ajar farmasi komputasi. Deepublish, Yogyakarta.
- Arunan, E, Desiraju, G.R., Klein, R.A., Sadlej, J.S., 2011. Definition of the hydrogen bond. Pure Appl Chem, 83(8), 1637-1641.
- Arya, N., and Kaur, Dr.A., 2022. Molecular docking: a review paper. International Journal of Innovative Research in Engineering & Managemen. 9 (1), 140-146.
- Azzahra, S.F., Harnelly, E., Subianto, M., Kusuma, W.A., and Sari, W., 2024. Identification and analysis of potential breast anticancer agents in pogostemon cablin through network pharmacology. JPPIPA. 10, 107-119. <https://doi.org/10.29303/jppipa.v10iSpecialIssue.7049>
- Batubara, I., Suparto, I.H., Sadiah, S., Matsuoka, R., and Mitsunaga, T. 2013. Effect of Zingiber zerumbet essential oils and zerumbone inhalation on body weight of Sprague dawley rat. Pakistan Journal of Biological Sciences. 16(19), 1028–1033. <https://doi.org/10.3923/pjbs.2013.1028.1033>.
- Bojarska, J., Remko, M., Breza, M., Madura, I.D., Kaczmarek, K., Zabrocki, J., and Wolf, W.M., 2020. A supramolecular approach to structure-based design with a focus on synthons hierarchy in ornithine-derived ligands: Review, synthesis, experimental and in silico studies. Molecules. 25, 1135.
- Borra, N.K., Kuna, Y., 2013. Evolution of toxic properties of antialzheimer's drugs through Lipinski's rule of five. Int J Pure App Biosci. 1, 28-36.
- Butt, S.S., Badshah, Y., Shabbir, M., and Rafiq, M., 2020. Molecular docking using chimera and autodock vina software for nonbioinformaticians. JMIR Bioinformatics and Biotechnology. 1(1), e14232. <https://doi.org/10.2196/14232>.
- Byrne, E.f.x., Sircar, R., Miller, P.S., Hedger, G., Luchetti, G., Nachtergaele, S., Tully, M.D., et al., 2016. Structural basis of smoothed regulation by its extracellular domains. Nature. 535, 517-522. <https://doi.org/10.1038/nature18934>.
- Chow, H.S., Garland, L.L., Hsu, C.H., Vining, D.R., Chew, W.M., Miller, J.A., Perloff, M., Crowell, J.A., Alberts, D.S., 2010. Resveratrol modulates drug-and carcinogen metabolizing enzymes in a healthy volunteer study. Cancer Prev Res. 3(9). 1168-1175. <https://doi.org/10.1158/1940-6207.CAPR-09-0155>.
- ana, Y.M., Iqbal, M.A., Ahamed, M.B., Ezzat, M.O., Majid, A.S., Anticancer, antioxidant and antimicrobial properties of the β -Caryophyllene from the essential oil of *Aquilaria crassna*. 20, 11808–11829. <https://doi.org/10.3390/molecules200711808>.



- Dai, D.N., Thang, D., Chau, T.M., and Ogunwande, I.A., 2013. Chemical constituents of the root essential oils of *Zingiber rubenz* Roxb. and *Zingiber zerumbet* (L.) Smith. Am.J.Plant.Sci. 4, 7-10. <https://doi.org/10.4236/ajps.2013.41002>.
- Daina, A., Michielin, O., Zoete, V., 2017. SwissADME: A free web tool to evaluate pharmacokinetics, druglikeness and medicinal chemistry friendliness of small molecules. Scintific report. 7, 42717. <https://doi.org/10.1038/srep42717>.
- Daisy, P., Suveena, S., Rajalakshmi, M., Lilly, V., 2011. Ligand based virtual screening on natural compounds for discovering active ligands. Der Pharma Chemica. 3(3), 51-7.
- Dash, B., Sahoo, A., Ray, A., Jena, S., and Nayak, S., 2020. Identification of chemical constituents of *Zingiber zerumbet* rhizome extract using GC/MS. Journal of Biologically Active Products from Nature. 10(5), 411–417. <https://doi.org/10.1080/22311866.2020.1821775>.
- Elaine, A.A., Nisa, A., and Tahara, N., 2023. In Silico Study of Mangosteen Fruit (*Garcinia mangostana* L.) as Pancreatic Anticancer Against AKT Kinase. Indonesian journal of biological pharmacy. 3(1), 19-32
- Ebelt, N.D., Zamloot V., and Manuel, E.R., 2020. Targeting desmoplasia in pancreatic cancer as an essential first step to effective therapy. Oncotarget. 11 (38), 3486-3488.
- Feldmann, G., Fendrich, V., McGovern, K., Bedja, D., Bisht, S., Alvares, H., 2008. An orally bioavailable small-molecul inhibitor of Hedgehog signaling inhibitors tumor initiation and metastasis in pancreatic cancer. Molecular cancer therapeutics. 7(9), 2725-35.
- Ferreira, L.G., Dos Sanots, R.N., Olivia, G., Andricopulo, A.D., 2015. Molecular docking and structure-based drug design strategies. Molecules. 20(7), 13384-13421. <https://doi.org/10.3390/molecules200713384>.
- Funkhouser, T. 2007. Protein-ligand docking methods. Princeton. New Jersey. Princeton University.
- Girola, N., Figueiredo, C.R., Farias, C.F., Azevedo, R.A., Ferreira, A.K., Teixeira, S.F., Capello, T.M., Martins, E.G., Matsuo, A.L., Travassos, L.R., 2015. Kamfena yang diisolasi dari minyak atsiri *Piper cernuum* (Piperaceae) menginduksi apoptosis intrinsik pada sel melanoma dan menunjukkan aktivitas antitumor secara in vivo. Biochem. Biophys. Res. Commun, 467, 928–934. <https://doi.org/10.1016/j.bbrc.2015.10.041>.
- Grant, T.J., Hua, K., and Singh, A., 2016. Molecular pathogenesis of pancreatic cancer. Progress in molecular biology and translatioan science. 144, 241-275. <https://doi.org/10.1016/bs.pmbts.2016.09.008>.
- Hanna, A., Shevde, L.A., 2016. Hedgehog signaling: modulation of cancer properties by the tumor microenvironment. Mol Cancer. 15 (24). <https://doi.org/10.1186/s12943-016-0509-3>.
- Ha, T., and Kouzuki ,H., 2018. Development of an artificial neural del for risk assessment of skin sensitization using human cell line test, direct peptide reactivity assay, KeratinoSens™ and in silico ert parameter. Journal of Applied Toxicology. 38b(4), 514-526.



- Honselmann, K.C., Pross, M., Jung, C.M., Wellner, U.F., Deichmann, S., Keck, T., Bausch, D., 2015. Regulation mechanisms of the hedgehog pathway in pancreatic cancer: a review. *JOP*. 16(1), 25-32. <https://doi.org/10.6092/1590-8577/2894>.
- Hosoya, T., Arai, M.A., Koyano, T., Kowithayakorn, T., Ishibashi, M., 2008. Naturally occurring small-molecule inhibitors of hedgehog/GLI-mediated transcription. *Chembiochem*. 9(7), 1082-92. <https://doi.org/10.1002/cbic.200700511>
- Hu, J.X., Lin, Y.Y., Zhao, C.F., Chen, W.B., Liu, Q.C., Li, Q.W., and Gao, F. 2021. Pancreatic cancer: A review of epidemiology, trend, and risk factors. *World Journal of Gastroenterology*, 27(27), 4298–4321. <https://doi.org/10.3748/wjg.v27.i27.4298>
- Hu, Q., Feng, M.L., Lai, L.M., Pei, J., 2018. Prediction of druglikeness using deep autoencoder neural networks. *Front. Genet*, 9(585), 1-8
- International Agency for Research on Cancer, 2020. The Global Cancer Observatory. Estimated Cancer Incidence, Mortality and Prevalence Worldwide in 2020. World Health Organization. Retrieved: <https://gco.iarc.fr>. (Diakses 23 Agustus 2023)
- Ilieva, Y, Kokanova-Nedialkova, Z, Nedialkov, P, Momekov, G., 2018. In silico ADME and drug-likeness evaluation of a series of cytotoxic polyprenylated acylphloroglucinols, isolated from *Hypericum annulatum* Morris subsp. *annulatum*. *Bulgarian Chemical Communications*. 50, 193-199.
- J. Le, 1998. Drug Bioavailability. MSD manual. Professional version. Retrieved from <https://www.msmanuals.com/professional>
- Jeng, K-S, Sheen, I-S, Leu, C-M, Tseng, P-H, Chang, C-F., 2020. The role of smoothened in cancer. *International journal of molecular sciences*. 21(18), 6863. <https://doi.org/10.3390/ijms21186863>.
- Jia, C-Yang, Li, J-Yi, Hao, G-Fei, and Yang, G-Fu, 2019. A drug-likeness toolbox facilitates ADMET study in drug discovery. *Drug discovery today*. <https://doi.org/10.1016/j.drudis.2019.10.014>
- Kelleher, F.C., 2011. Hedgehog signaling and therapeutics in pancreatic cancer. *Carcinogenesis*. 32(4), 445-51. <https://doi.org/10.1093/carcin/bgq280>.
- Kesuma, D., Siswandon., Purwanto, B.T., dan Hardjon, S., 2018. Uji in silico aktivitas sitotoksik dan toksisitas senyawa turunan n-(benzoil)-n'- 90 feniltiourea sebagai calon obat antikanker. *Journal Of Pharmaceutical Science And Clinical Research*. 1. <https://doi.org/10.20961/jpscr.v3i1.16266>.
- Koga, A.Y., Beltrame, F.L., and Pereira, A.V., 2016. Several aspects of *Zingiber zerumbet*: a review. *Revista Brasileira De Farmacognosia*. 26(3), 385–391. <https://doi.org/10.1016/j.bjpr.2016.01.006>.
- Li, A.K., Dong, Y., Zhong, H.A., Mondal, G., Lin, F. , Kumar, V. , and , 2017. Design, synthesis and biological evaluation of novel inhibitors for treating pancreatic cancer. *scientific reports*. 7, <https://doi.org/10.1038/s41598-017-01942-7>



- Kun Hao, Xiao-Dong Tian, Chang-Fu Qin, and Xue-Hai Xie., 2013. Hedgehog signaling pathway regulates human pancreatic cancer cell proliferation and metastasis. *Oncology reports*, 29(3), 1124-1132.
- Lallo, S., Kasim, S., Tayeb, R., Hasan, A. D., Sere, H., Ismail, I., and Arifin, T., 2018. Analisis zerumbone dalam *Zingiber zerumbet* dan aktivitas penghambatannya terhadap bakteri mycobacterium tuberculosis. *Jurnal Farmasi Galenika (Galenika Journal of Pharmacy)* (e-Journal), 4(2), 126–132. <https://doi.org/10.22487/j24428744.2018.v4.i2.11138>.
- Levin, G.M., 2012. P-glycoprotein: why this drug transporter may be clinically important. *Curr Psychiatry*. 11, 38-40.
- Lianah, 2019. Biodiversitas zingiberaceae mijen Kota Semarang. Edisi revisi 2020. Deepublish, Yogyakarta, 56-58.
- Lipinski, C.A., Lombardo, F., Dominy, B.W., and Feeney, P.J., 1997. Experimental and computational approaches to estimate solubility and permeability in drug discovery and development settings. *Advanced Drug Delivery Reviews*. 23, 3-25
- Lipinski, C.A., Lombardo, F., Dominy, B.W., and Feeney, P.J., 2001. Experimental and computational approaches to estimate solubility and permeability in drug discovery and development settings. *Advanced Drug Delivery Reviews*. 46, 3-26.
- Lipinski, C.A., Lombardo, F., Dominy, B.W., and Feeney, P.J., 2012. Experimental and computational approaches to estimate solubility and permeability in drug discovery and development settings. *Advanced Drug Delivery Reviews*. 64, 4–17.
- Lu, H., et al., 2019. Recent advances in the development of protein–protein interactions modulators: Mechanisms and clinical trials. *Signal Transduction and Targeted Therapy*, 4(1), 1-23.
- Lynch, T., Price, A.L., 2007. The effect of cytochrome P450 metabolism on drug response, interactions, and adverse effects. *Am Fam Physician*. 76, 391-396.
- Mahanthesh Mt, Dr. Ranjith, Raghavendra Yaligar, R. Jyothi, G. Narappa and Ravi Mv., 2020. SwissADME prediction of phytochemicals present in *Butea monosperma* (Lam.) Taub. *Journal of Pharmacognosy and Phytochemistry*. 9(3), 1799-1809.
- Mardianingrum, R., Bachtiar, K.R., Susanti, S., Nuraisah, A.N.A. and Ruswanto, R., 2021. Studi in silico senyawa 1, 4-Naphthalenedione-2- Ethyl-3-Hydroxy sebagai antiinflamasi dan antikanker payudara. *ALCHEMY Jurnal Penelitian Kimia*. 17(1), 83-95
- Mitra, S. and Dash, R., 2018. natural products for the management and prevention of cer. Evidencebased complement alternative medicine. 1-23. <https://doi.org/10.1155/2018/8324696>
- Monahue, T., 2019. Pancreatic Cancer. *JAMA*. 322(14), 1426. <https://doi.org/10.1001/jama.2019.14699>.
- Pereira, L.Q.R.d, Farias Morais, H.G.d., Souto Medeiros, M.R.d., A., Rodini, C.O., Coletta, R.D., 2024. The anticancer potential of



- kaempferol: a systematic review based on in vitro studies. *Cancers.* 16, 585. <https://doi.org/10.3390/cancers16030585>
- Muchtaridi, M., Dermawan, D., and Yusuf, M., 2018. Molecular docking 3D structure based pharmacophore modelling, and ADME predicton of Alpha Mangostin and its derivatives against estrogen reseptor Alpha. *J Young Pharm.* 10 (3), 252-259. <https://doi.org/10.5530/jyp.2018.10.58>.
- Mukesh, B. and Rakesh, K., 2011. Molecular Docking: A Review. *International Journal of Research in Ayurveda & Pharmacy.* 2(6), 1746-1751.
- Nadendla, R.R., 2004. Molecular modelling: A powerful tool for drug design and molecular docking. *J. Resonance.*
- Niyaz, M.N., Khan, M.S., Wani, R.A., Shah, O.J., Besina, S. and Mudassar, S., 2019. Nuclear localization and overexpression of smoothened in pancreatic and colorectal cancers. *Journal of cellular biochemistry.* 120(7), 11941-11948. <https://doi.org/10.1002/jcb.28477>
- Okimoto, N., Noriyuki, F., Hideyoshi, F., Atsushi, S., Gentaro, M., Ryoko, Y., Yousuke, O., et al., 2009. High-performance drug discovery: computational screening by combining docking and molecular dynamics simulations. *MD-Based Screening in Drug Design.* <https://doi.org/10.1371/journal.pcbi.1000528>.
- Onishi, H. and Katano, M., 2011. Hedgehog signaling pathway as a therapeutic target in various types of cancer. *Cancer Sci.* 102(10), 1756–1760. <https://doi.org/10.1111/j.1349-7006.2011.02010.x>
- Padalia R.C., Darokar M.P., Verma Ram.S., Chauhan A., Singh Ved.R., Goswami P., Singh S., Verma S.K., Luqman S., Chanotiya C.S., 2018. Zingiber zerumbet (L.) Roscoe ex Sm. from northern India: Potential source of zerumbone rich essential oil for antiproliferative and antibacterial applications. *Industrial Crops and Products,* 749-754. <https://doi.org/10.1016/j.indcrop.2018.01.006>
- Pandiri, A.R., 2014. Overview of exocrine pancreatic pathobiology. *Toxicol Pathol.* 42(1), 207–216. <https://doi.org/10.1177/0192623313509907>
- Paramashivam, S.K, Elayaperumal, K., Natarajan, B., devi Ramamoorthy M., Balasubramanian. S., Dhiraviam, K.N., In silico pharmacokinetic and molecular docking studies of small molecules derived from Indigofera aspalathoides Vahl targeting receptor tyrosine kinases. *Bioinformation.* 11, 73.
- Patlewicz, G., Jeliazkova, N., Safford, R.J., Worth, A.P., and Aleksiev, B., 2008. An evaluation of the implementation of the Cramer classification scheme in the Toxtree software, SAR and QSAR in Environmental Research 19, 495-524, <https://doi.org/10.1080/10629360802083871>.
- Pereira, C., Coutinho, I., Soares, J., Bessa, C., Leão, M., Saraiva, L., 2012. New cancer-related proteins provided by the yeast model. *FEBS J.* -712. <https://doi.org/10.1111/j.1742-4658.2012.08477.x>.
- Telli, G., 2019. Molecular docking: shifting paradigms in drug design. *International journal of molecular sciences.* 20(18), 4331.
- İksikologi: Mekanisme, terapi antidotum dan penilaian risiko. epok.



- Quazi, S., Mathur, K., Arora, S., 2013. Calotropis procera: An overview of its phytochemistry and pharmacology. Indian Journal of Drugs. 1(2), 63-69
- Rahman, H.S, Rasedee, A., Yeap, S.K., Othman, H.H., Chartrand, M.S., Namvar, F., Abdul, A.B, How, C.W., 2014. Biomedical properties of a natural dietary plant metabolite, zerumbone, in cancer therapy and chemoprevention trials. BioMed Research International. 920742. <https://doi.org/10.1155/2014/920742>.
- Rifai, Y., 2012. A new method for fast isolation of GLI inhibitory compounds. International journal of pharma research and review. (8), 28-30.
- Roy, S., Kumar, A., Baig, M.H., Masarik, M., Provaznik, I., 2015. Virtual screening ADMET profiling, molecular docking and dynamics approaches to search for patent selective natural molecules based inhibitors against metallothionein-III to study Alzheimer's disease. Upub. 15(10), 83-105.
- Sabol, M., Trnski, D., Musani, V., Ozretić, P., Levanat, S., 2018. Role of GLI transcription factors in pathogenesis and their potential as new therapeutic targets. Int J Mol Sci. 19(9), 2562. <https://doi.org/10.3390/ijms19092562>.
- Seca, A.M.L. and Pinto, D.C.G.A., 2018. Plant secondary metabolites as anticancer agents: successes in clinical trials and therapeutic application. International Journal of Molecular Science, 19(1), 263. <https://doi.org/10.3390/ijms19010263>.
- Seelig, A., 2020. P-glycoprotein: one mechanism, many tasks and the consequences for pharmacotherapy of cancers. Frontiers in Oncology. 10, 576559..
- Silalahi, M., 2018. Botani dan bioaktivitas lempuyang (*Zingiber zerumbet* (L.) Smith.). Jurnal Edu Mat Sains. 2(2), 147-160.
- Sinaga, E., Rahayu, S.E., Wahyuningsih, E., dan Matondang, I., 2000. Katalog tumbuhan obat di Indonesia. Zingiberaceae. Universitas Nasional Press. Jakarta.
- Skoda, A.M., Simovic, D., Karin, V., Kardum, V., Vranic, S., Serman, L., 2018. The role of the Hedgehog signaling pathway in cancer: A comprehensive review. Bosn J Basic Med Sci. 18(1), 8-20. <https://doi.org/10.17305/bjbm.2018.2756>.
- Sliwoski, G., Kothiwale, S., Meiler, J., and Lowe, E.W., 2014. Computational methods in drug discovery. Pharmacol Rev. 66(1), 334-395. <https://doi.org/10.1124/pr.112.007336>.
- Solowey, E., Lichtenstein, M., Sallon, S., Paavilainen, H., Solowey, E., Lorberbaum-Galski, H., 2014. Evaluating medicinal plants for anticancer activity. Scientific World Journal. 721402. <https://doi.org/10.1155/2014/721402>.
- Tang, J.Y., So, P.L., Epstein, E.H. Jr., 2007. Novel Hedgehog pathway targets against carcinoma. Toxicol Appl Pharmacol. 224(3), 257-264. <https://doi.org/10.1016/j.taap.2006.12.011>.
- Pan, K., Ullah, I., Mussarat, S., Sun, F., Abiodun, O.O., Batbaatar, Ind Song, D., 2017. A systematic review on ethnomedicines of plants. Phytotherapy Research. 31, 202–264. <https://doi.org/10.1002/ptr.5751>.



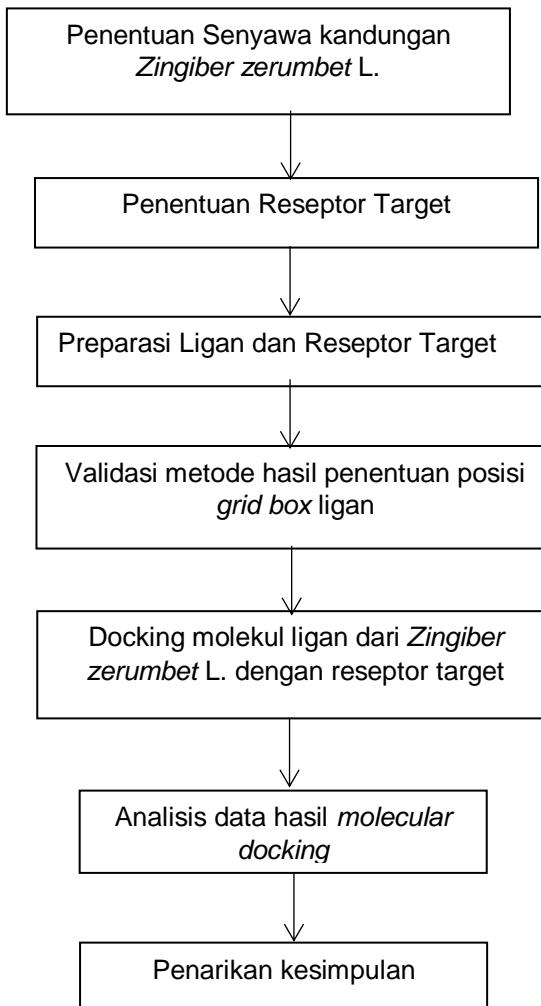
- Thayer, S.P., di Magliano, M.P., Heiser, P.W., Niselsen, C.M., Roberts Dj, Lauwers G.Y., 2003. Hedgehog is an early and late mediator of pancreatic cancer tumorigenesis. *Nature*. 425, 851-856
- Tian, M., Wu, X., Hong, Y., Wang, H., Deng, G., Zhou Y., 2020. Comparison of chemical composition and bioactivities of essential oils from fresh and dry rhizomes of *Zingiber zerumbet* (L.) Smith. *Biomed Res Int.* 9641284. <https://doi.org/10.1155/2020/9641284>.
- Tilaqza, A., Herbani, M., dan Aqilah, Z., 2023. Studi docking molekular penghambatan reseptor neprilisin Bunga Lawang (*Illicium verum*) sebagai antihipertensi dan prediksi profil farmakokinetiknya. *Biosaintropis*. 9 (1), 52-62.
- Walter, K., Omura, N., Hong, S.-M., Griffith, M., Vincent, A., Borges, M., Goggins, M., 2010. Overexpression of smoothened activates the sonic hedgehog signaling pathway in pancreatic cancer-associated fibroblasts. *Clin. Cancer Res.* 16, 1781–1789
- Wang, F., Ma, L., Zhang, Z., Liu, X., Gao, H., Zhuang, Y., Yang, P., Kornmann, M., Tian, X., Yang, Y., 2016. Hedgehog signaling regulates epithelial-mesenchymal transition in pancreatic cancer stem-like cells. *J. Cancer*. 7(4), 408–417. <https://doi.org/10.7150/jca.13305>.
- Wu, Fujia, Zhang, Yu, Sun, Bo, McMahon, A.P., Wang, Yu., 2017. Hedgehog signaling: from basic biology to cancer therapy. *Cell Chemical Biology*. 24(3), 252-280. <http://dx.doi.org/10.1016/j.chembiol.2017.02.010>
- Yob, N.J., S.M. Jofrry, M.M.R.M.M. Affandi, L.K.T., Salleh, M.Z., and Zakaria, Z.A., 2011. *Zingiber zerumbet* (L.) Smith: A review of its ethnomedicinal, chemical, and pharmacological uses. *Evid based complement. alternat med.* 1-12. <https://doi.org/10.1155/2011/543216>.
- Yoon, H. J., Cho, Y. S., & Kim, D. H., 2020. Recent advances in in silico ADMET prediction: Systems and applications. *Korean Journal of Chemical Engineering*, 37(6), 1045–1062. <https://doi.org/10.1007/s11814-020-0545-6>
- Zhang., Q., Liu, H., Qiao, and Y. Liu., 2012. Zerumbone, a southeast asian ginger sesquiterpene, induced apoptosis of pancreatic carcinoma cells through p53 signaling pathway. *Evidence-Complementary and Alternative Medicine*. 936030. <https://doi.org/10.1155/2012/936030>.



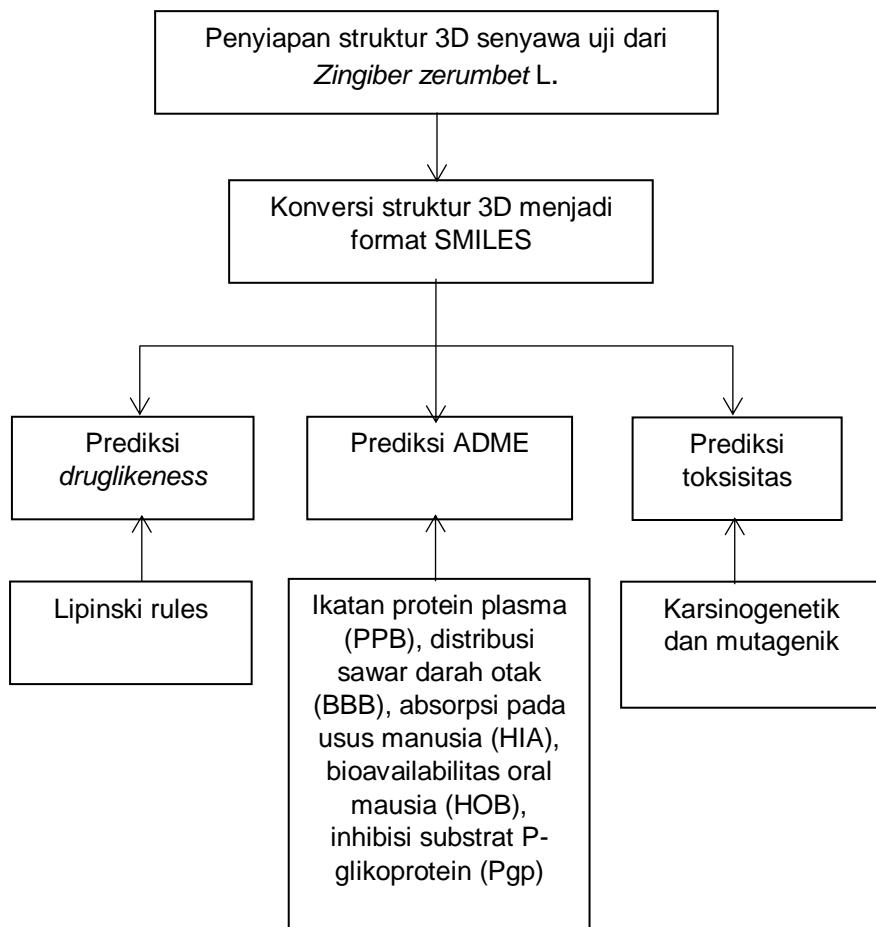
LAMPIRAN

Lampiran 1. Skema Kerja

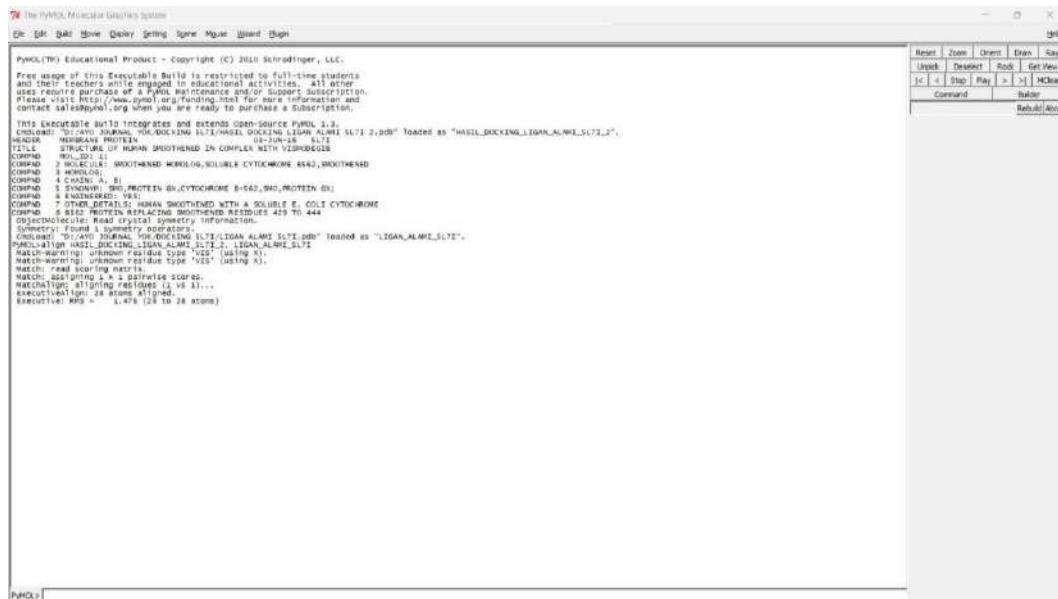
1.1 Molecular Docking



1.2 Profil Farmakokinetik dan Toksisitas

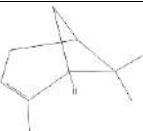
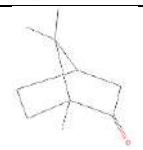
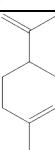


Lampiran 2. Hasil RMSD *native ligand* terhadap reseptor Smo

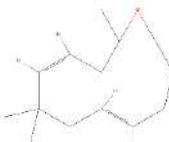
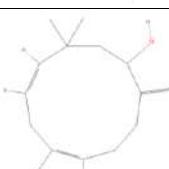
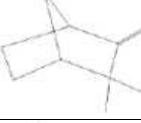
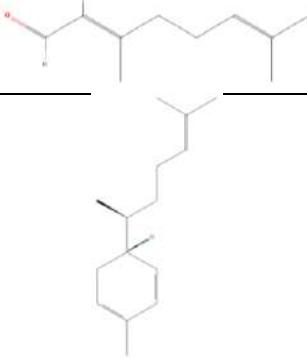


Optimized using
trial version
www.balesio.com

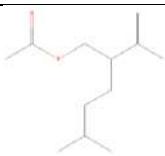
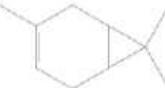
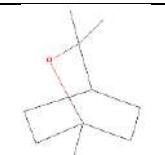
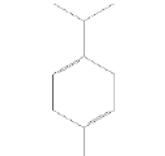
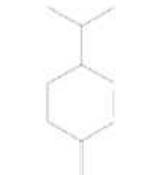
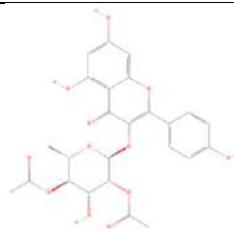
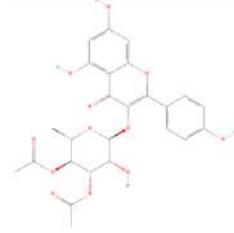
Lampiran 3. Gambar Struktur Senyawa *Zingiber zerumbet* L. (Koga et al., 2016; Tian et al., 2020)

No.	Ligan	Rumus Struktur	Kelas
1	Zerumbone		
2	Borneol		
3	α -Pinene		
4	Camphor		
5	Linalool		Terpen
6	Limonene		
7	α -Humulene		
8	β -Caryophyllene		

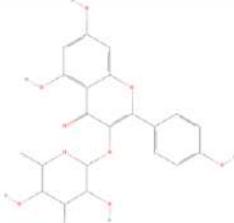
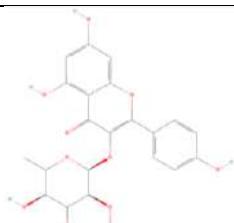
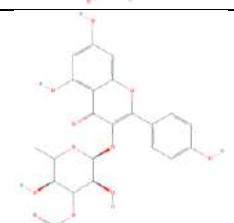
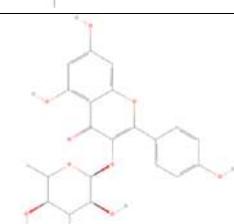
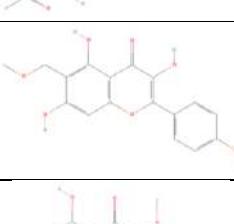
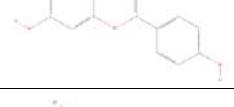
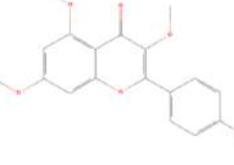


10	Humulene Epoksid II		
11	Humulene Epoksid III		
12	Humulenol I		
13	Humulenol II		
14	Caryophyllene Oxide		Terpen
15	Camphene		
16	Sabinene		
17	Citral		

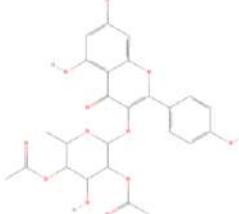
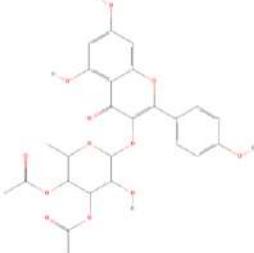
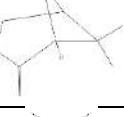


19	Lavandulyl Acetate		
20	3-Carene		
21	4-Terpineol		
22	Eucalyptol		Terpen
23	γ -Terpinene		
24	β - Phellandrene		
25	β -Myrcene		
26	3-methyl kaempferol, kaempferol-3- O- (2,4-di-O-acetyl- α - l- rhamnopyranoside)		Flavonoid
	3-O- ethyl- α - noside)		

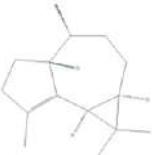


28	Kaempferol-3-O-rhamnoside		
29	Kaempferol 3-(2"-acetyl)rhamnoside)		
30	Kaempferol 3-(3"-acetyl)rhamnoside)		
31	Kaempferol 3-(4"-acetyl)rhamnoside)		
32	Kaempferol-3,4'-O-dimethylether		
33	Kaempferol-3-O-methylether		
	3,4',7-ther		Flavonoid

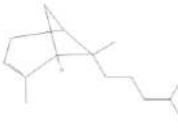
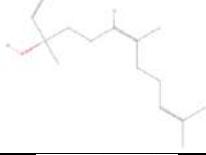
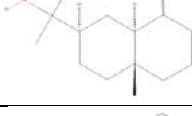
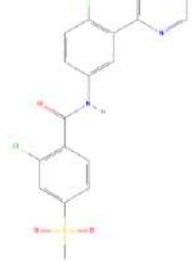


35	4"-O-Acetylafzelin			
36	2",4"-Diacetylafzelin			Flavomoid
37	3",4"-Diacetylafzelin			
38	Tricyclene			
39	α -Terpineol			
40	β -Pinene			Terpen
41	α -Phellandrene			



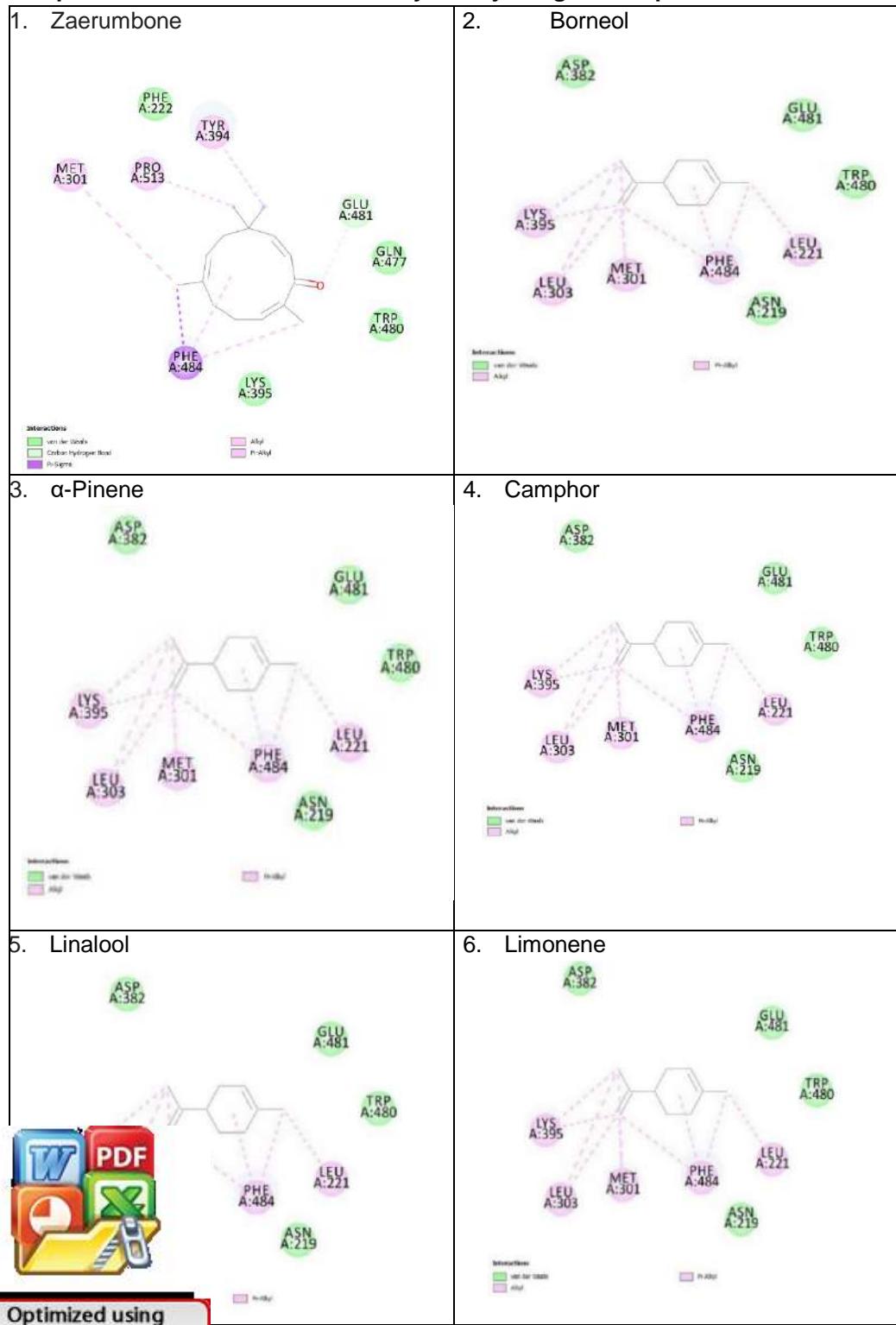
43	p-Cymene		
44	Fenchone		
45	I-Borneol		
46	Verbenone		
47	I-Bornyl acetate		
48	Isobornyl acetate		
49	Myrtenyl acetate		
50	α -Copaene		
51	β -Elemene		
			
			Terpen

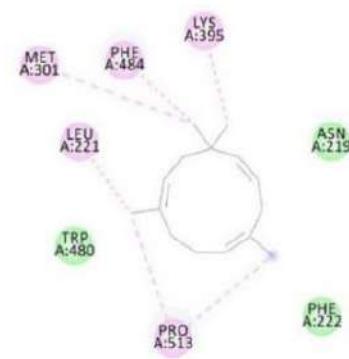
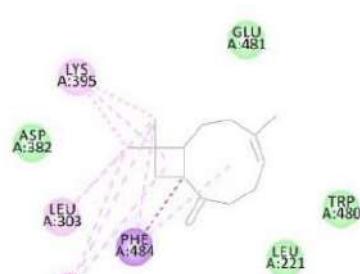


53	α -Bergamotene		Terpen
54	δ -Cadinene		
55	Hedycaryol		
56	d-Nerolidol		
57	Allo-Aromadendrene epoxide		
58	β -Eudesmol		
59	Vismodegib		

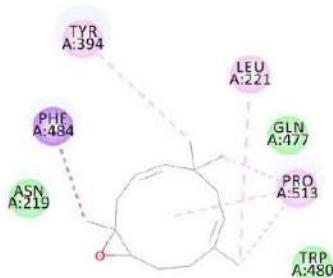


Lampiran 4. Visualisasi Interaksi Senyawa Uji dengan Reseptor Smo

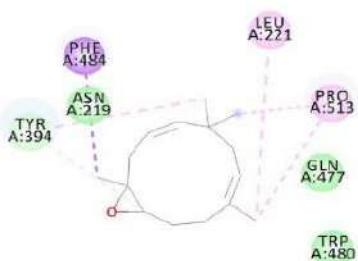


7. α -Humulene8. β -Caryophyllene

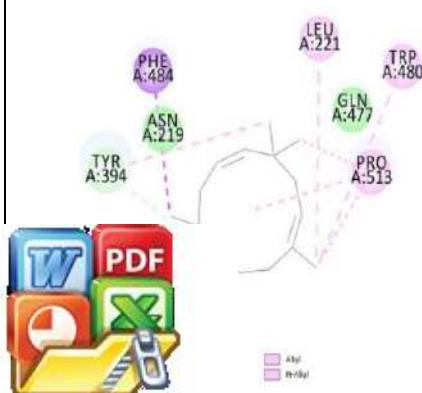
9. Humulene Epoksid I



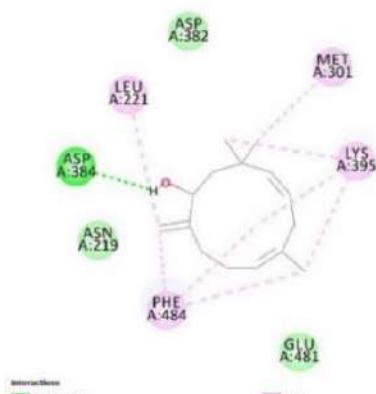
10. Humulene Epoksid II



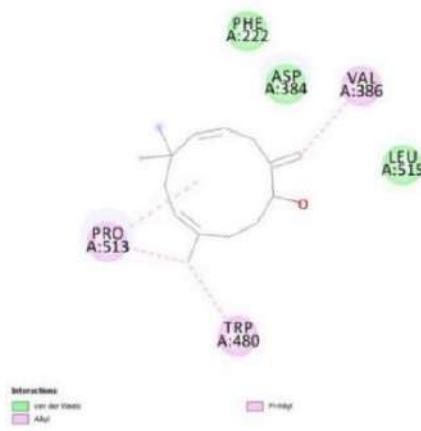
11. Humulene Epoksid III



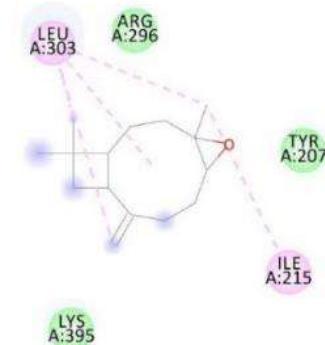
12. Humulenol I



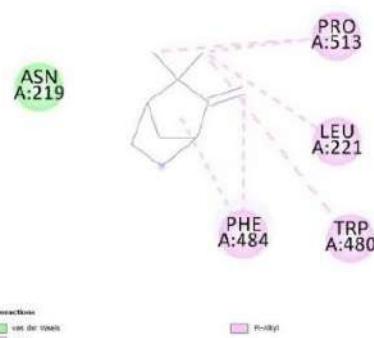
13. Humulenol II



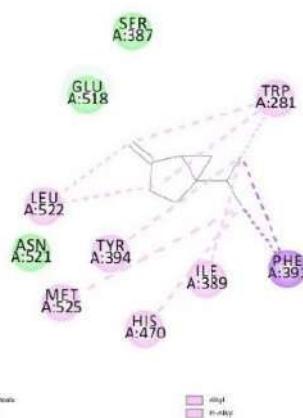
14. Caryophyllene Oxide



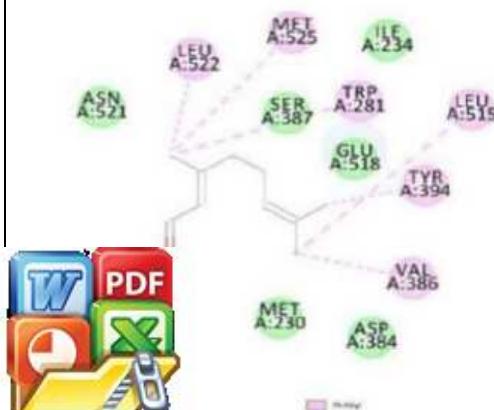
15. Camphene



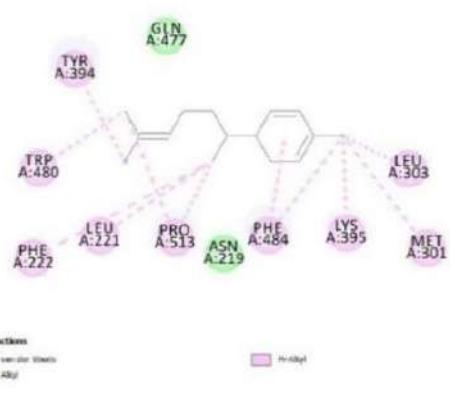
16. Sabinene



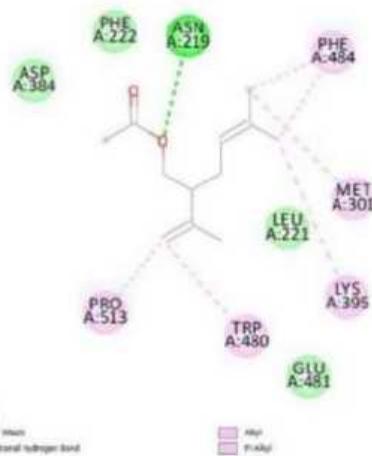
17. Citral



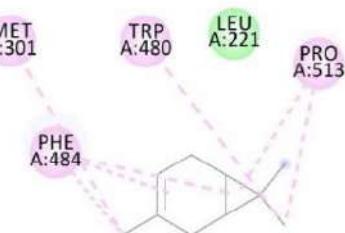
18. Zingiberene



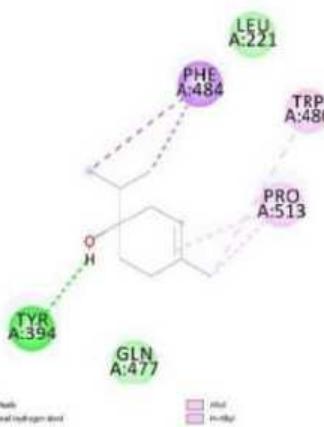
19. Lavandulyl Acetate



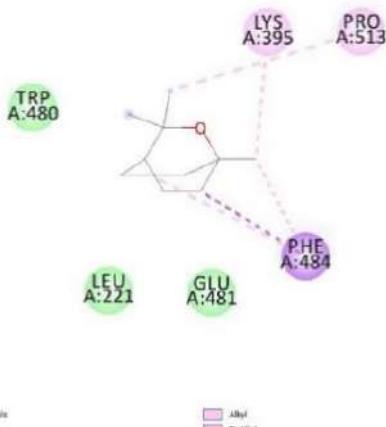
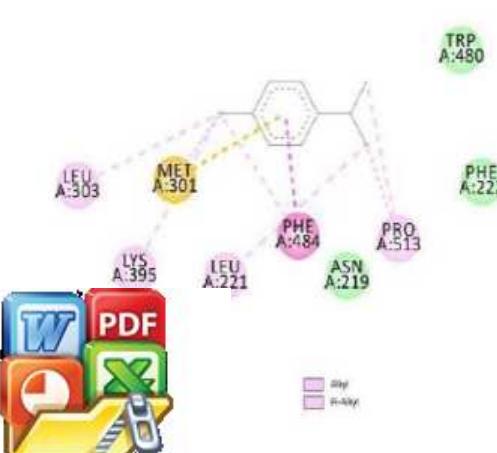
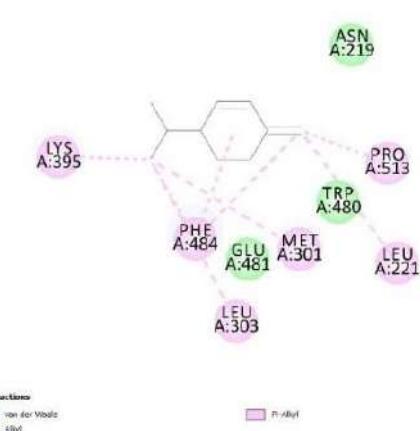
20. 3-Carene

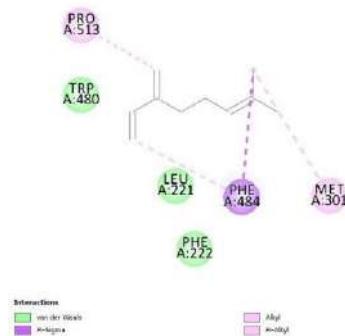
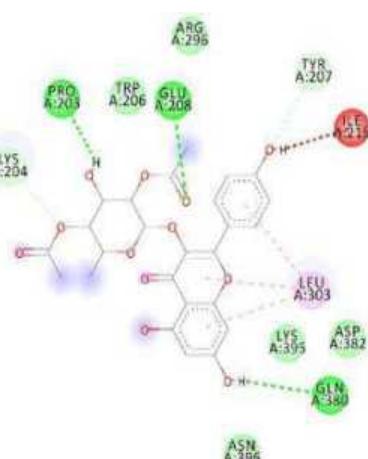
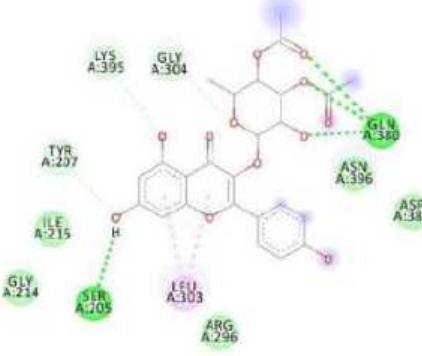


21. 4-Terpineol

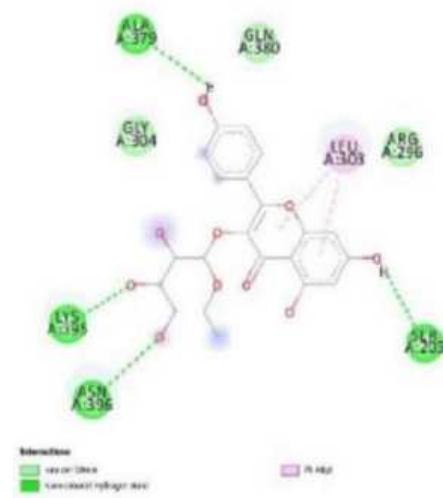


22. Eucalyptol

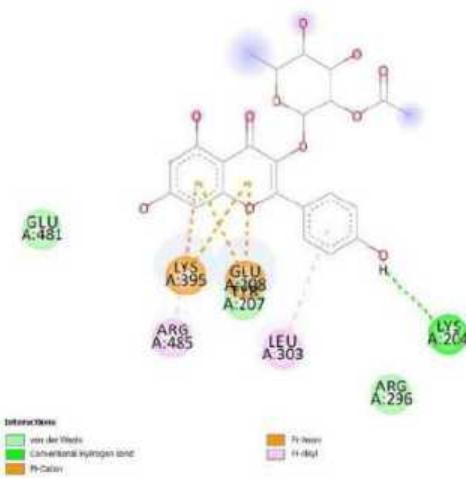
23. γ -Terpinene24. β -Phellandrene

25. β -Myrcene26. 3-methyl kaempferol, kaempferol-3-O-(2,4-di-O-acetyl- α -l-rhamnopyranoside)27. Kaempferol-3-O-(3,4-di-O-acetyl- α -l-rhamnopyranoside)

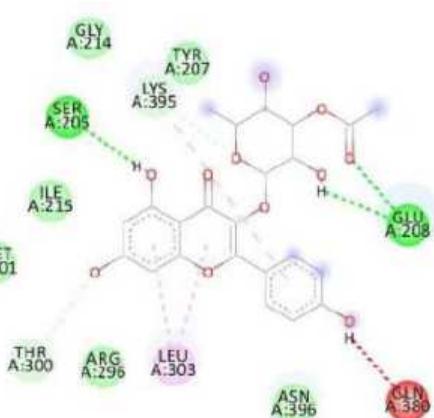
28. Kaempferol-3-O-rhamnoside



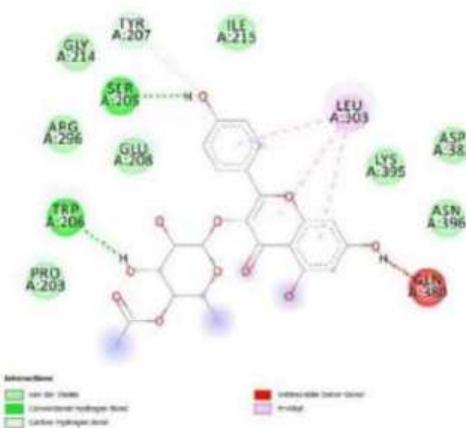
29. Kaempferol 3-(2"-acetylglucoside)



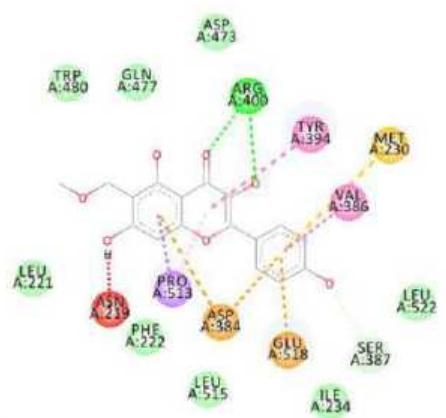
30. Kaempferol 3-(3"-acetylglucoside)



31. Kaempferol 3-(4"-acetylglucoside)



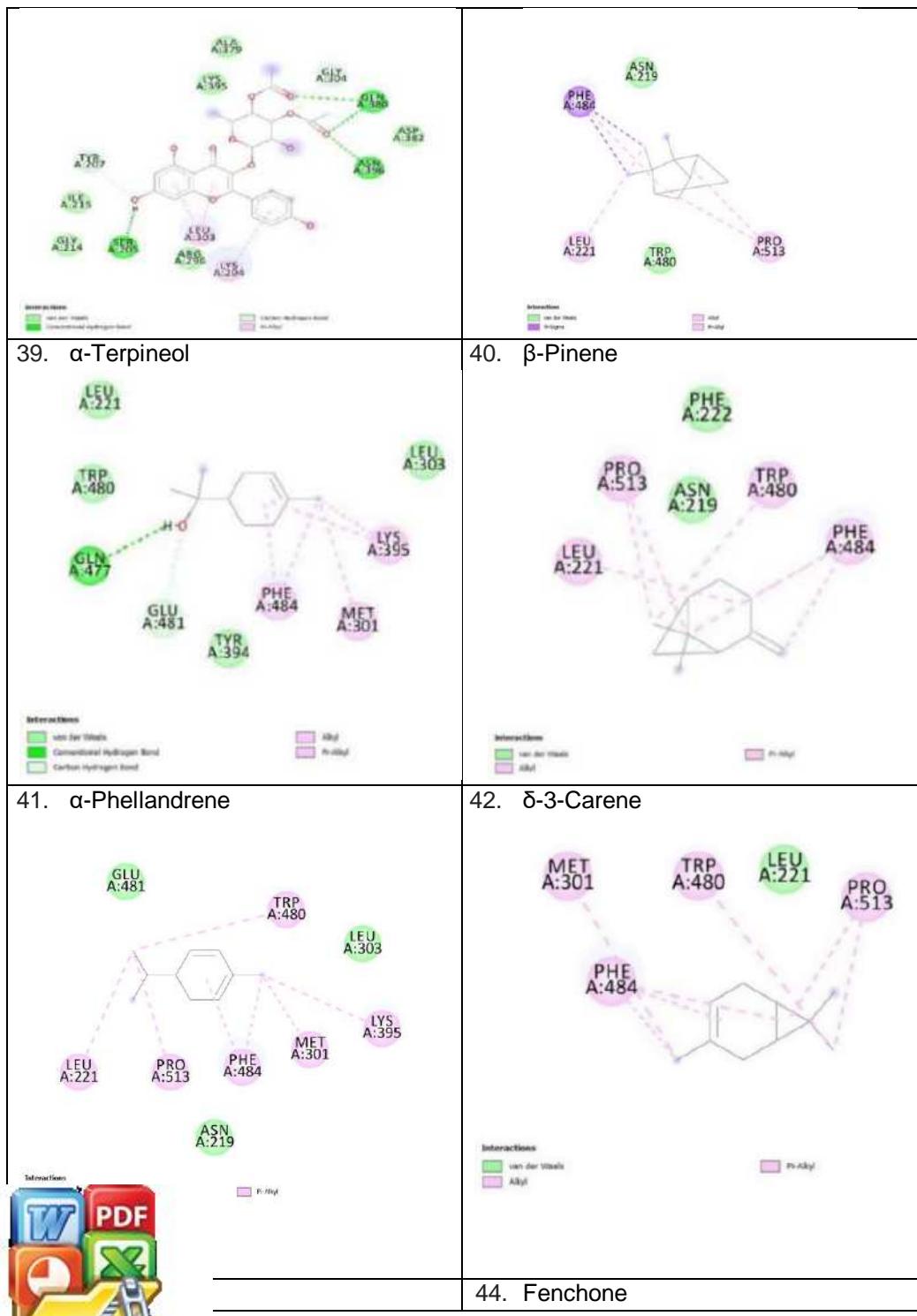
32. Kaempferol-3,4' -O-dimethylether

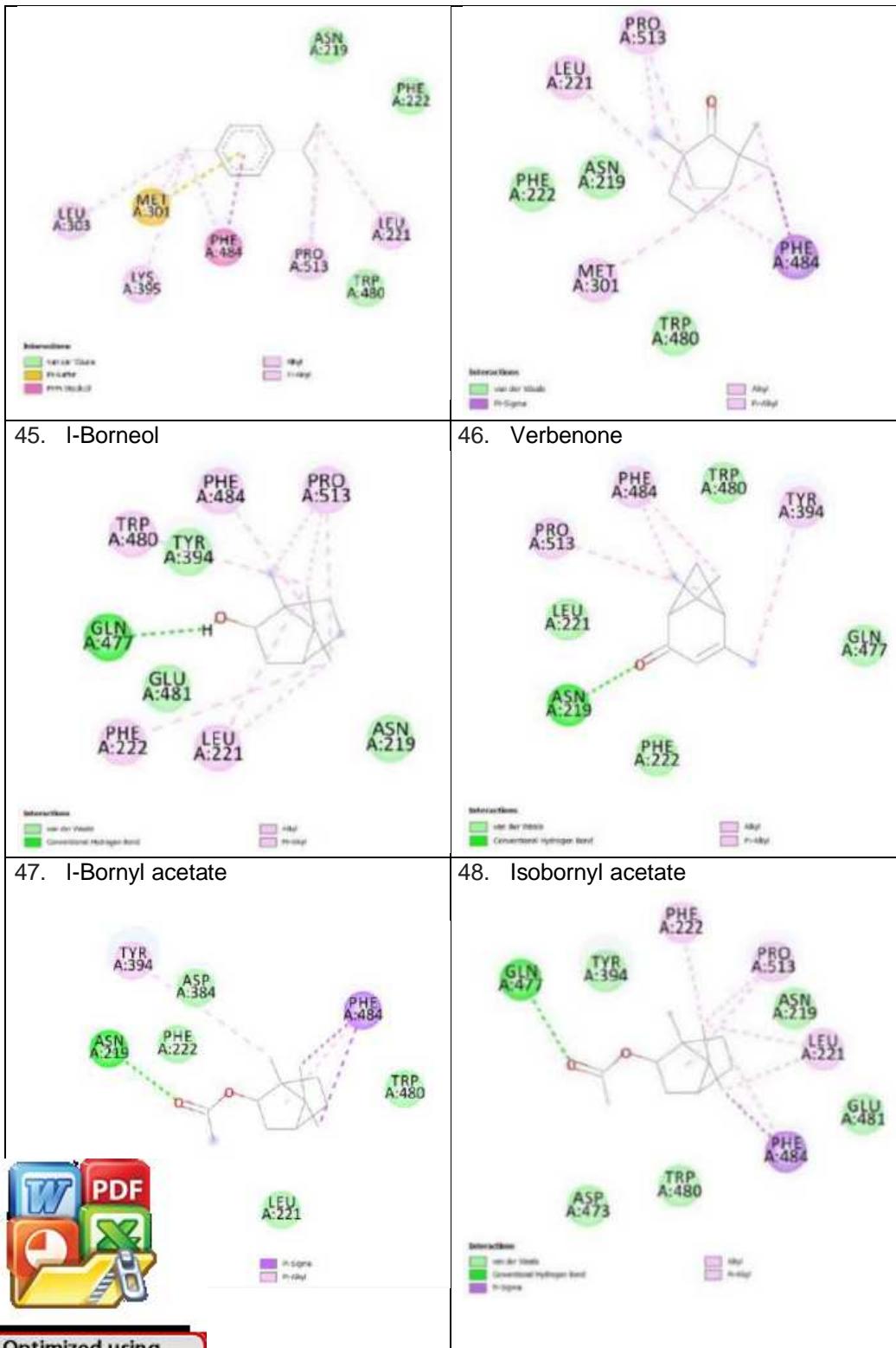


Optimized using
trial version
www.balesio.com

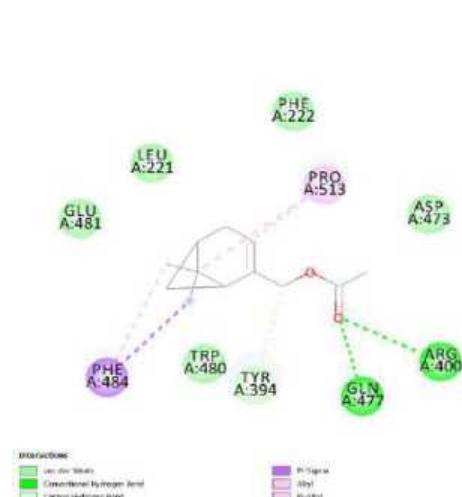
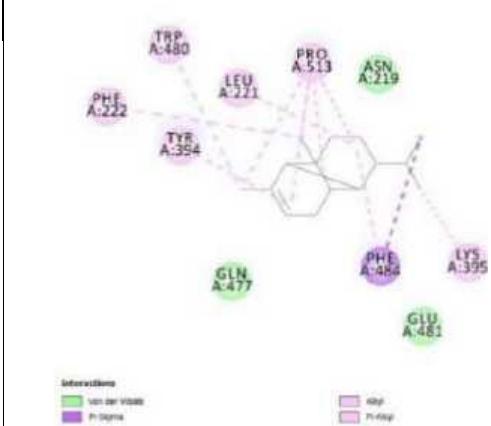
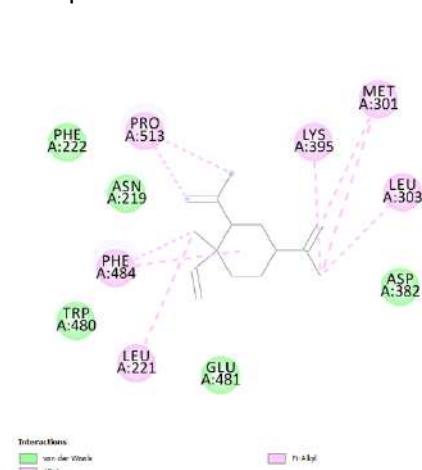
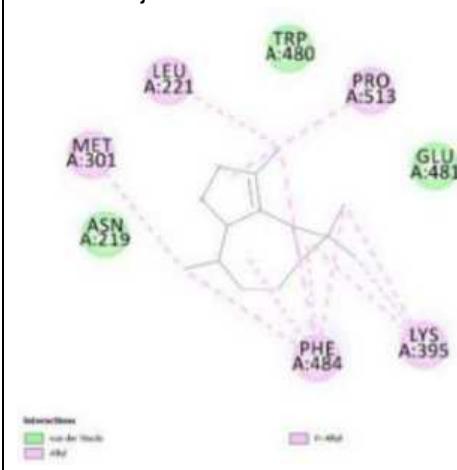
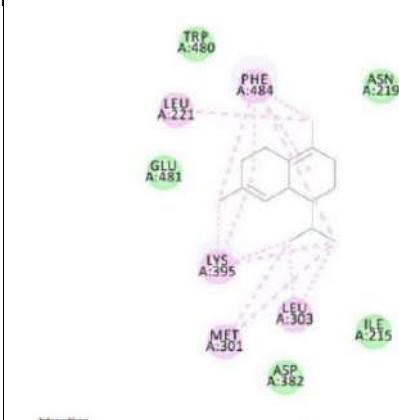


Optimized using
trial version
www.balesio.com

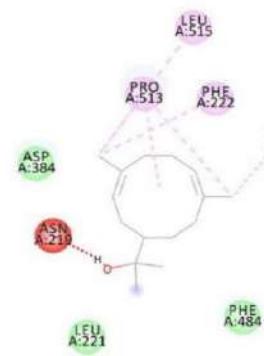




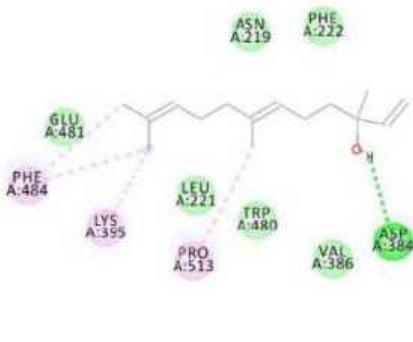
49. Myrtenyl acetate

50. α -Copaene51. β -Elemene52. α -Gurjunene53. α -Bergamotene54. δ -Cadinene

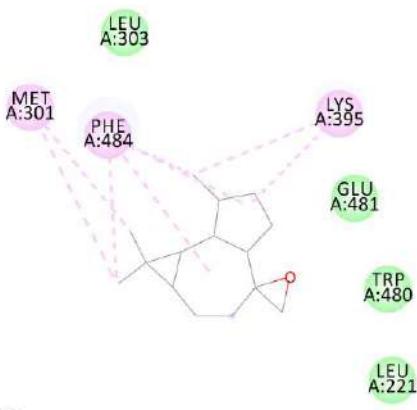
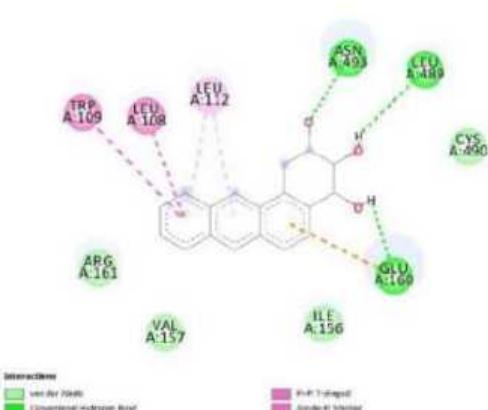
55. Hedycaryol



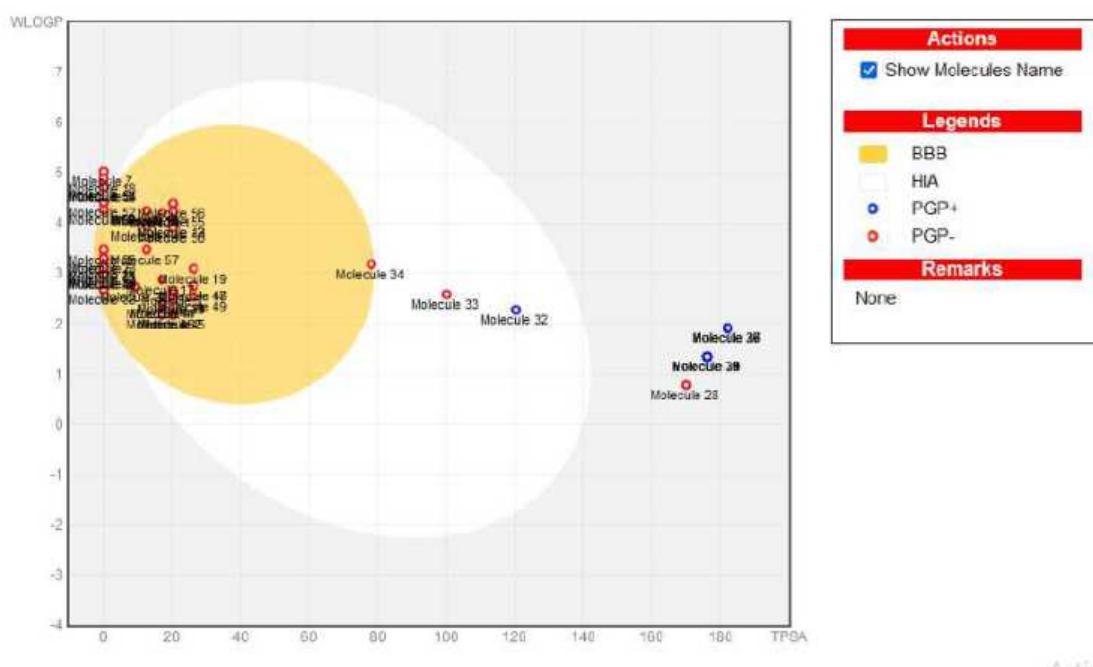
56. d-Nerolidol



57. Allo-Aromadendrene epoxide

58. β -Eudesmol

Optimized using
trial version
www.balesio.com

Lampiran 5. Visualisasi Boiled Egg senyawa uji

A. Muliadi



Optimized using
trial version
www.balesio.com