DAFTAR PUSTAKA

1. Susilo A, Rumende CM, Pitoyo CW, Santoso WD, Yulianti M, Herikurniawan H, et al. Coronavirus Disease 2019: Tinjauan Literatur Terkini. J Penyakit Dalam Indones. 2020;7(1):45.

2. World Health Organization. COVID-19 Weekly Epidemiological Update 22. World Heal Organ. 2021;(December):1–3.

3. Lilyawati SA, Fitriani N, Prasetya F. Proceeding of Mulawarman Pharmaceuticals Conferences. Proceeding Mulawarman Pharm Conf. 2019;135–8.

4. Khaerunnisa S, Kurniawan H, Awaluddin R, Suhartati S. Potential Inhibitor of COVID-19 Main Protease (M pro) from Several Medicinal Plant Compounds by Molecular Docking Study. 2020;(March):1–14.

5. Yasin SA, Azzahra A, Ramadhan NE, ... Studi Penambatan Molekuler dan Prediksi ADMET Senyawa Bioaktif Beberapa Jamu Indonesia terhadap SARS-CoV-2 Main Protease (Mpro). Berk Ilm …. 2020;7(2):24–41.

6. Akmalasari I, Purwati E, Dewi R. Isolasi dan identifikasi jamur endofit tanaman manggis (Garcinia mangostana L). Biosfera. 2013;30(2):82–9.

7. Silico I, Irritation E. berpotensi menyebabkan korosi maupun iritasi pada kulit dan tidak berpotensi menyebabkan luka bakar dan luka bakar yang parah pada mata . 2012;47–9.

8. Reseptor P, Alfa E. UJI IN SILICO SENYAWA 2,6-

DIHIDROKSIANTRAQUINON SEBAGAI LIGAN PADA RESEPTOR ESTROGEN ALFA Felicia Fraulein Setiawan *) , Enade Perdana Istyastono Fakultas Farmasi, Universitas Sanata Dharma, Yogyakarta. 2015;12(2):77–80.

9. Ekowahyuni LP. Daya Simpan Buah Manggis (Garcinia mangostana L.) Pada Perlakuan Pelapisan. J Ilmu dan Budaya. 2016;40(54).

10. Mardiana L. Ramuan dan Khasiat Kulit Manggis. Jakarta: Penebar Swadaya; 2011.

11. Nidyasari RRS, Akmal H, Ariyanti NSRI, Biologi D, Matematika F, Alam P, et al. Karakterisasi Morfologi dan Anatomi Tanaman Manggis dan Kerabatnya (Garcinia spp.) di Taman Buah Mekarsari. J Sumberd Hayati. 2018;4(1).

12. Hazimi H, Fitmawati, Emrizal. Skrining Fitokimia Ramuan Obat Pahit Suku Melayu Lingga Kepulauan Riau. J Riau Biol. 2018;3(1):34–40.

13. Syakir D. Khasiat Buah Manggis Untuk Kehidupan. J al-Hikmah. 2014;15(1):66–74.

14. Mulyati B. Potensi Herbal Dalam Pencegahan dan Penanganan Pasien CoVID-19. Indept. 2020;9(1):1–5.

15. Larasati AL, Gozali D, Haribowo C. Penggunaan Desinfektan dan Antiseptik Pada Pencegahan Penularan Covid-19 di Masyarakat. Maj Farmasetika. 2020;5(3):137–45.

16. Ismail Marzuki, dkk. Covid-19 Seribu Satu Wajah. Yayasan Kita Menulis.

2021

17. Levani Y, Prastya AD, ... Coronavirus Disease 2019 (COVID-19): Patogenesis, Manifestasi Klinis dan Pilihan Terapi. J Kedokt dan Kesehat. 2021;17(1):44–57.

18. Hamid S, Mir MY, Rohela GK. Novel coronavirus disease (COVID-19): a pandemic (epidemiology, pathogenesis and potential therapeutics). New Microbes New Infect. 2020;35:100679.

20. Dewi YK, Riyandari BA. Potensi Tanaman Lokal sebagai Tanaman Obat dalam Menghambat Penyebaran COVID-19. J Pharmascience. 2020;7(2):112.

21. Li X, Geng M, Peng Y, Meng L, Lu S. Molecular immune pathogenesis and diagnosis of COVID-19. J Pharm Anal. 2020;10(2):102–8.

22. Dong L, Hu S, Gao J. Discovering drugs to treat coronavirus disease 2019 (COVID-19). Drug Discov Ther. 2020;14(1):58–60.

23. Feriandi Y. Bunga Rampai Artikel Penyakit Virus Korona (COVID-19) Editor : Titik Respati. Kopidpedia. 2020;203–15.

24. Jeyanathan M, Afkhami S, Smaill F, Miller MS, Lichty BD, Xing Z. Immunological considerations for COVID-19 vaccine strategies. Nat Rev Immunol. 2020;20(10):615–32.

25. KemenkesRI. Vaksinasi Covid-19 Lindungi Diri, Lindungi Negeri. Vol. 9, Kementerian Kesehatan RI. 2021. 22–50 p.

26. Levine-Tiefenbrun M, Yelin I, Katz R, Herzel E, Golan Z, Schreiber L, et al.

Initial report of decreased SARS-CoV-2 viral load after inoculation with the BNT162b2 vaccine. Nat Med. 2021;

27. Baxter D. Active and passive immunity, vaccine types, excipients and licensing. Occup Med (Chic Ill). 2007;57(8):552–6.

28. Fakih TM, Dewi ML. IDENTIFIKASI PROTEASE UTAMA (Mpro) SEBAGAI MAKROMOLEKUL TARGET DALAM PENGEMBANGAN KANDIDAT INHIBITOR NOVEL CORONAVIRUS 2019 (SARS-CoV-2) SECARA IN SILICO. J Ilm Farm Farmasyifa. 2020;3(2):84–91.

29. Purwaniati P, Asnawi A. Target Kerja Obat Covid-19: Review. J Farmagazine. 2020;7(2):30.

30. Saputri KE, Fakhmi N, Kusumaningtyas E, Priyatama D, Santoso B. Docking Molekular Potensi Anti Diabetes Melitus Tipe 2 Turunan Zerumbon Sebagai Inhibitor Aldosa Reduktase Dengan Autodock-Vina. Chim Nat Acta. 2016;4(1):16.

31. Biokimia D, Fisika D. SIMULASI DOCKING KURKUMIN ENOL , BISDEMETOKSIKURKUMIN DAN ANALOGNYA SEBAGAI INHIBITOR ENZIM12-LIPOKSIGENASE. 10(1):55–67.

32. Sana NK, . IH, . EMH, . RKS. Identification, Purification and Characterization of Lipase from Germinating Oil Seeds (Brassica napus L.). Pakistan J Biol Sci. 2004;7(2):246–52.

34. Julianto TS. Biomolekul dalam Perspektif Al- Qur'an. 2015. 101 p.

35. Darmayanti T, Permana M, Jambe A, Suparathna I, Pratiwi K, Wiadnyani S.

Kajian Asam Amino pada Fermentasi Talas (Colocasia esculenta L. Schott). J Ilm Teknol Pertan AROTECHNO. 2017;2(1):154–60.

36. Rollando. Pengantar Kimia Medisinal. 2017. 716 p.

37. Vinsiah R, Fadhillah F. Studi Ikatan Hidrogen Sistem Metanol-Metanol dan Etanol-Etanol dengan Metode Molekular Dinamik. Sainmatika J Ilm Mat dan Ilmu Pengetah Alam. 2018;15(1):14.

38. Lipinski CA, Lombardo F, Dominy BW, Feeney PJ. Experimental and computational approaches to estimate solubility and permeability in drug discovery and development settings. Adv Drug Deliv Rev. 2012;64(SUPPL.):4–17.

39. Kim S, Thiessen PA, Cheng T, Yu B, Shoemaker BA, Wang J, et al. Literature information in PubChem: Associations between PubChem records and scientific articles. J Cheminform. 2016;8(1):1–16.

40. Client DS, Studio D, Discovery T, Client S. Introduction to the Discovery Studio Client. :1–7.

41. Syahputra G. Peran Bioinformatika dalam Desain Kandidat Molekul Obat. Lembaga Ilmu Pengetahuan Indonesia. BioTrend. 2015;1:(1):26

42. Johnson E. William L.T. Structural and Functional Diversity in the FGf Receptor Multigene Family. Howard Hughes Medical Institute. 1990

43. Ferreira G, Andricopulo DA. Editorial : Chemoinformatics Approaches to Stucture and Ligand-Based Drug Design. Frontier in Pharmacology. 2018;9:1416

44. Guido RVC, Olivia G, Andricopulo AD. Structure and Ligand Based Drug Design Approaches for Neglected Tropical Diseases. 2012. 84;9:1857

45. Zumla A, Chan J. F. W, Yuen K. Y. Reviews: Coronaviruses Drug Discovery and Therapeutic Options. Nature Reviews Drug Discovery. 2016;15:329

46. Walls A.C, Park Y.J, Tortorici M.A, Wall A, McGuire A.T, Veesler D. Structure, Function, and Antigenicity of the SARS-CoV-2 Spike Glycoprotein. Cell. 2020;180;283

47. Ikawati. Z. Mengenal Reseptor ACE2, "Pintu Masuk" Virus Covid-19. Fakultas Farmasi Universitas Gadjah Mada. 2020

48. Broglia R.A, Tiana G. Simona F. Design of HIV-1-PR Inhibitors that do not Create Resistance: Blocking the Folding of Single Monomers.

49. Tjay, Rahadja. Obat-obat Penting. PT. Alex Media Komputindo Jakarta. 2007

50. Yang H, Nkeze J, Zhao R.Y. Effects of HIV-1 Protease on Cellular Functions and their Potential Applications in Antiretroviral Therapy. Cell and Bioscience. 2012;2:32

51. Moussa N, Hassan A, Gharaghani S. Pharmacophore Model, Docking, QSAR, and Molecular Dynamics SimulationStudies of Substituted Cyclic Imides and Herbal Medicinesas COX-2 Inhibitors. Heliyon. 2021;7:2

52. Doak. B.C, Kihlberg J. Oral Druggable Space Beyond the Rule of 5: Insights from Drugs and Clinical Candidates. 2014;21:(9):1115-1142

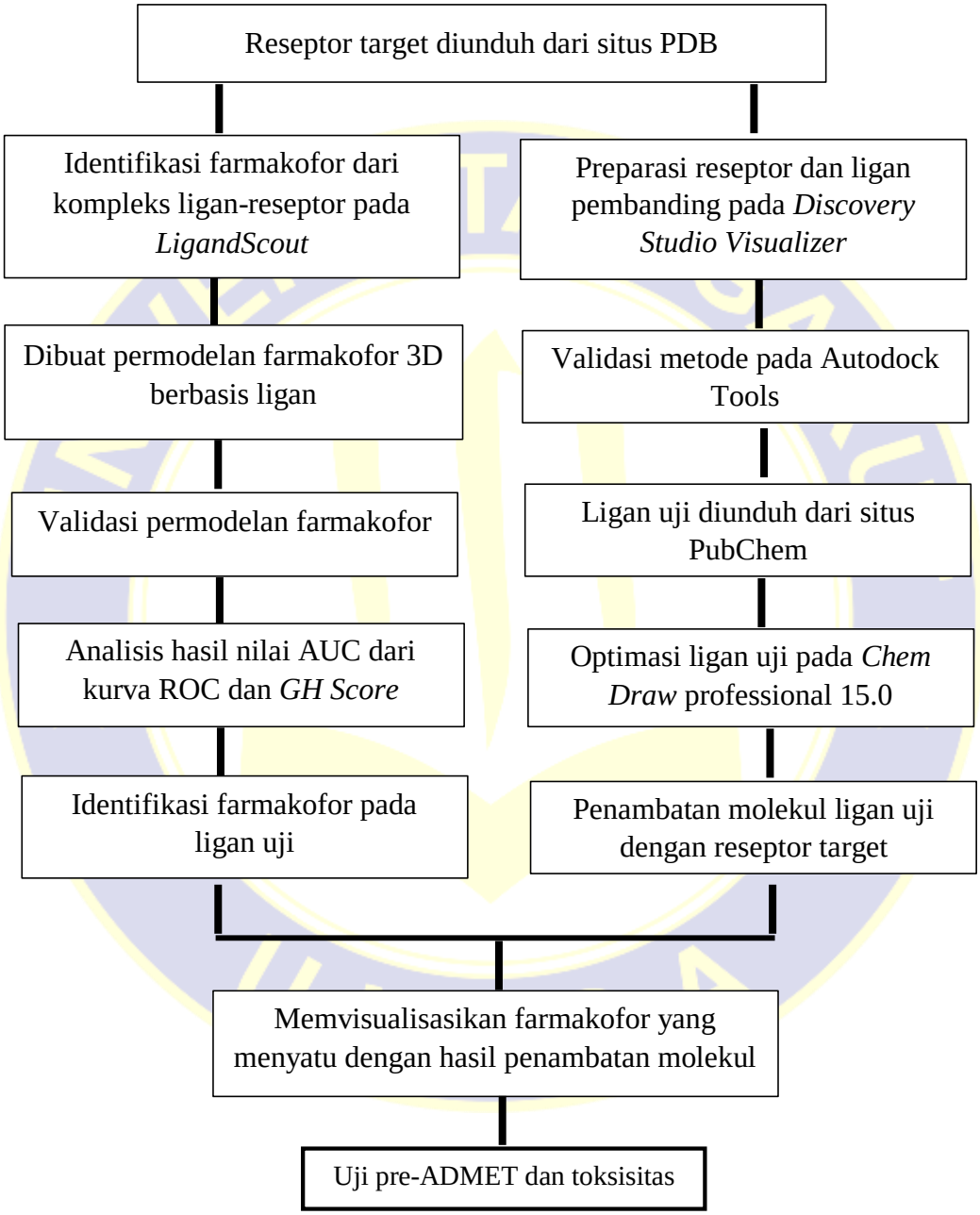
LAMPIRAN 1

TANAMAN MANGGIS

Gambar II.1 Tanaman manggis

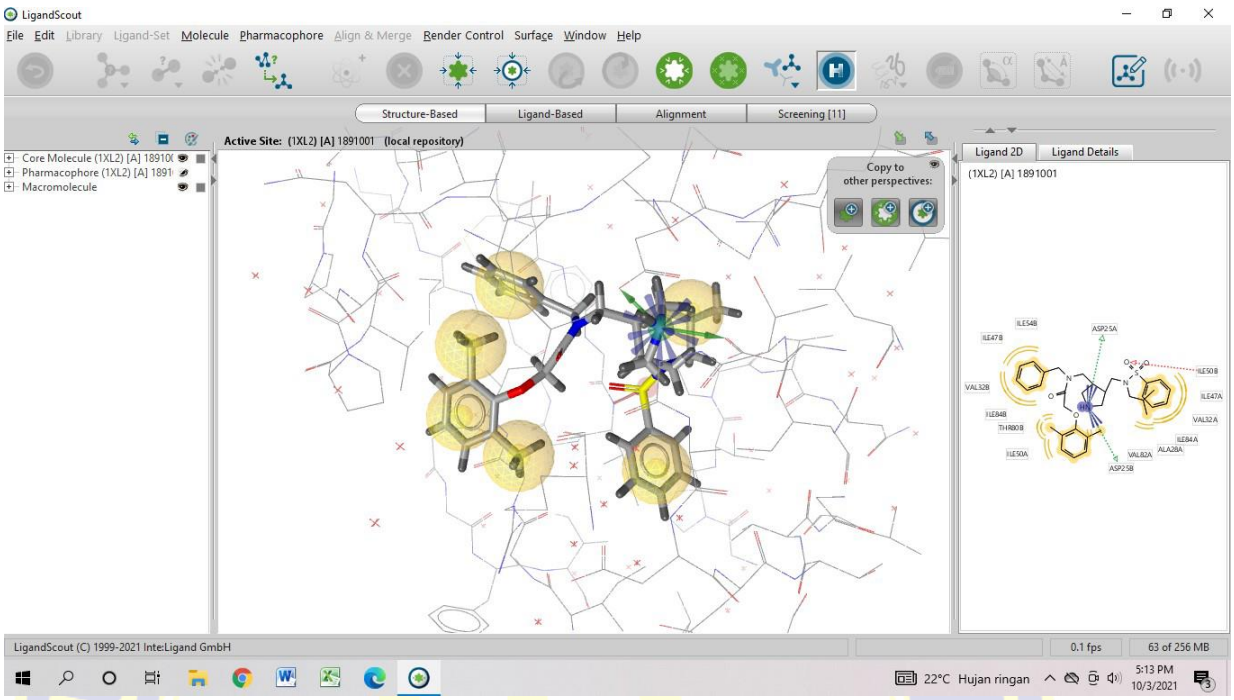
LAMPIRAN 2

ALUR PENELITIAN FARMAKOFOR MODELING DAN MOLECULAR DOCKING

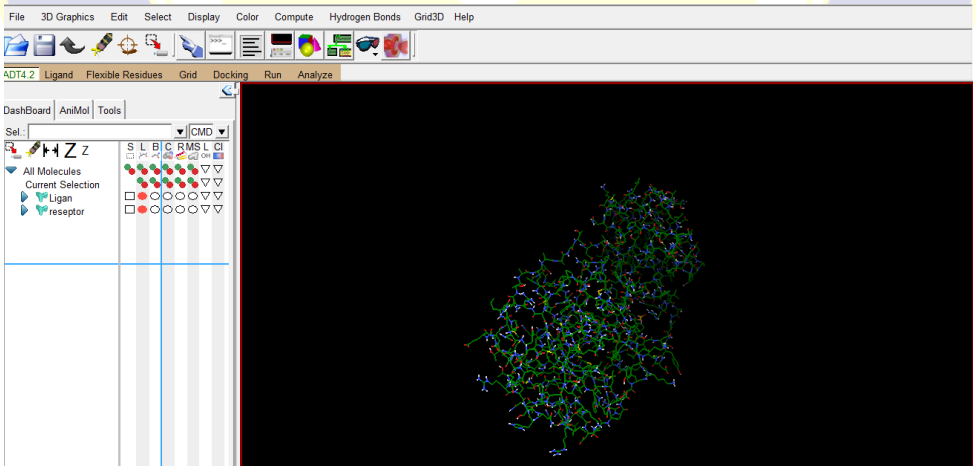


LAMPIRAN 3

APLIKASI DAN SITUS



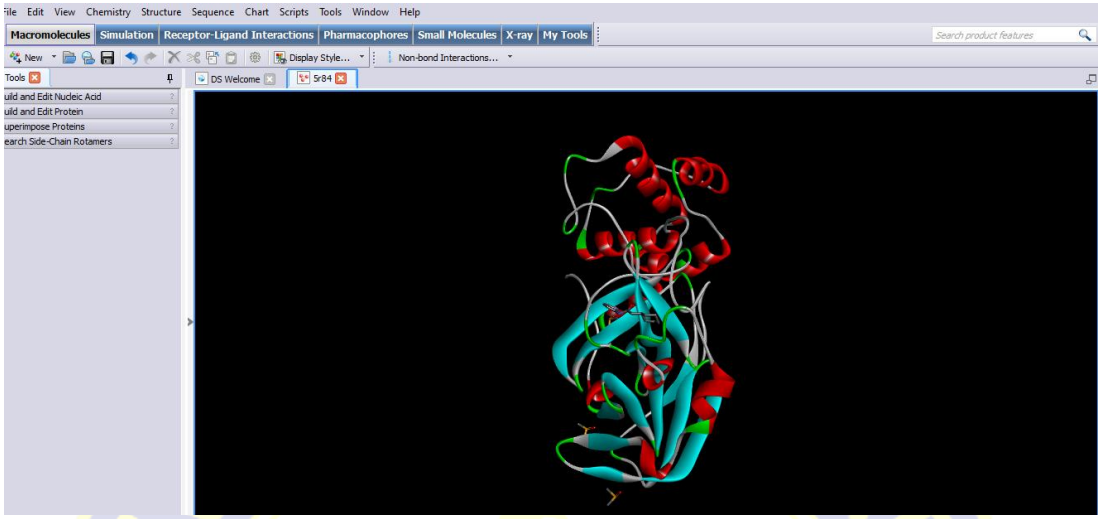
Gambar IV.1 Tampilan *LigandScout*®



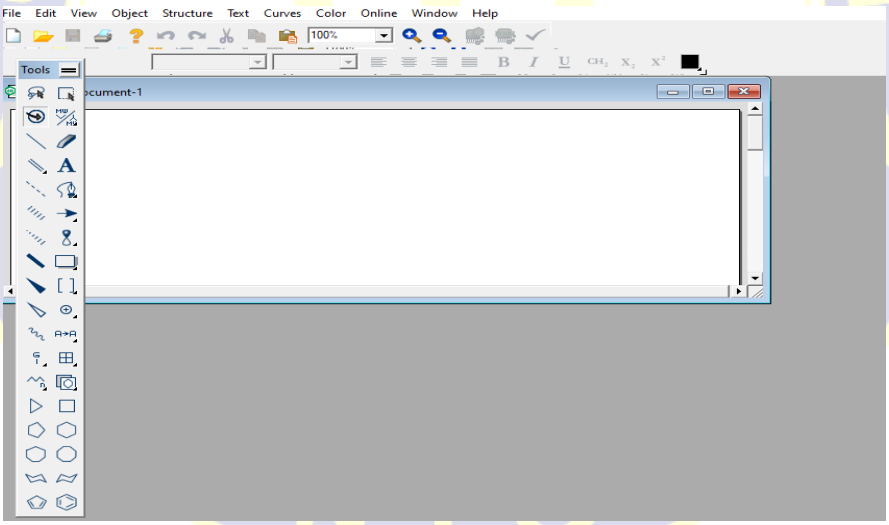
Gambar IV.2 Tampilan *Autodock Tools*®

LAMPIRAN 3

(LANJUTAN)



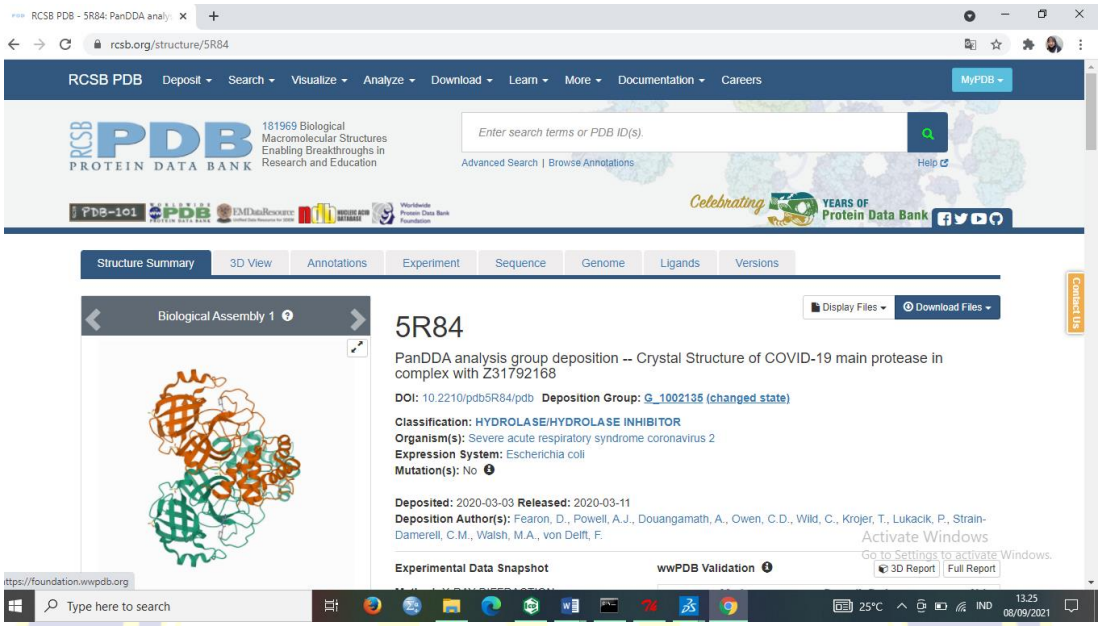
Gambar IV.3 Tampilan *Discovery Studio Visualizer*®



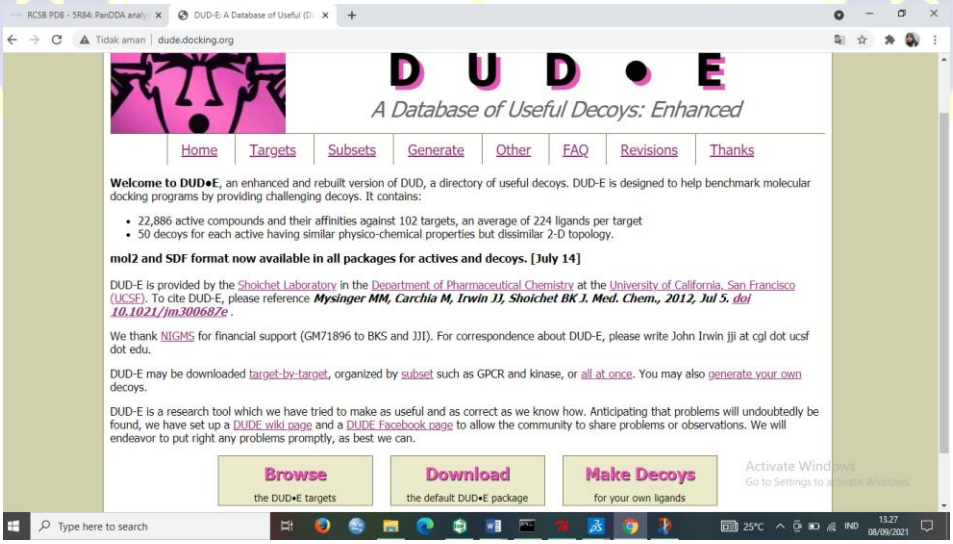
Gambar IV.4 Tampilan *ChemDraw 12.0*®

LAMPIRAN 2

(LANJUTAN)



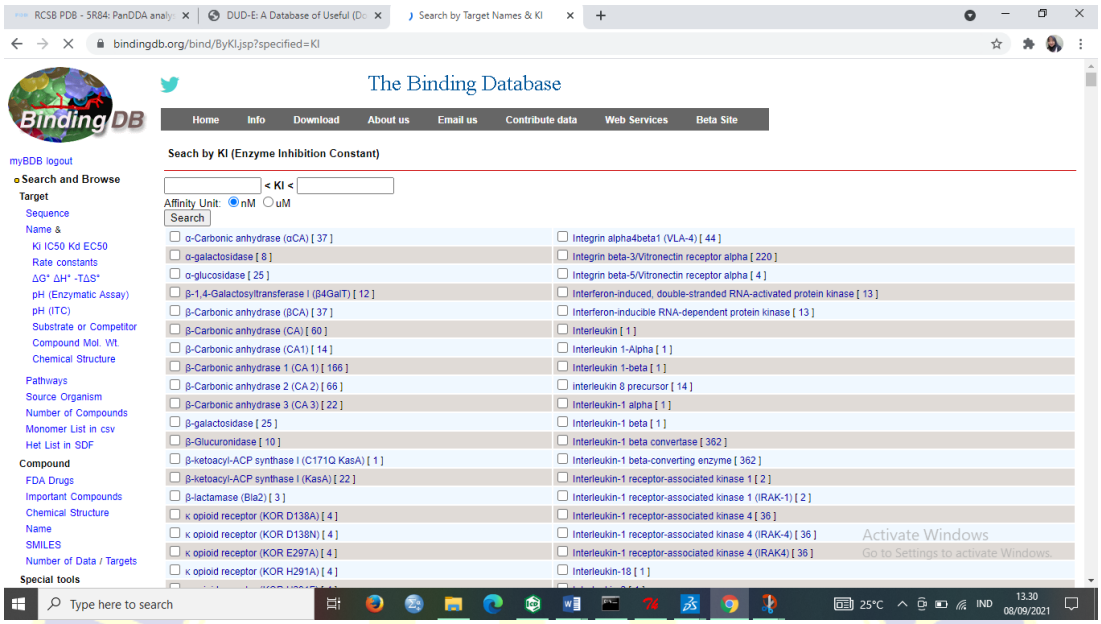
Gambar IV.5 Tampilan situs *Protein Data Bank*



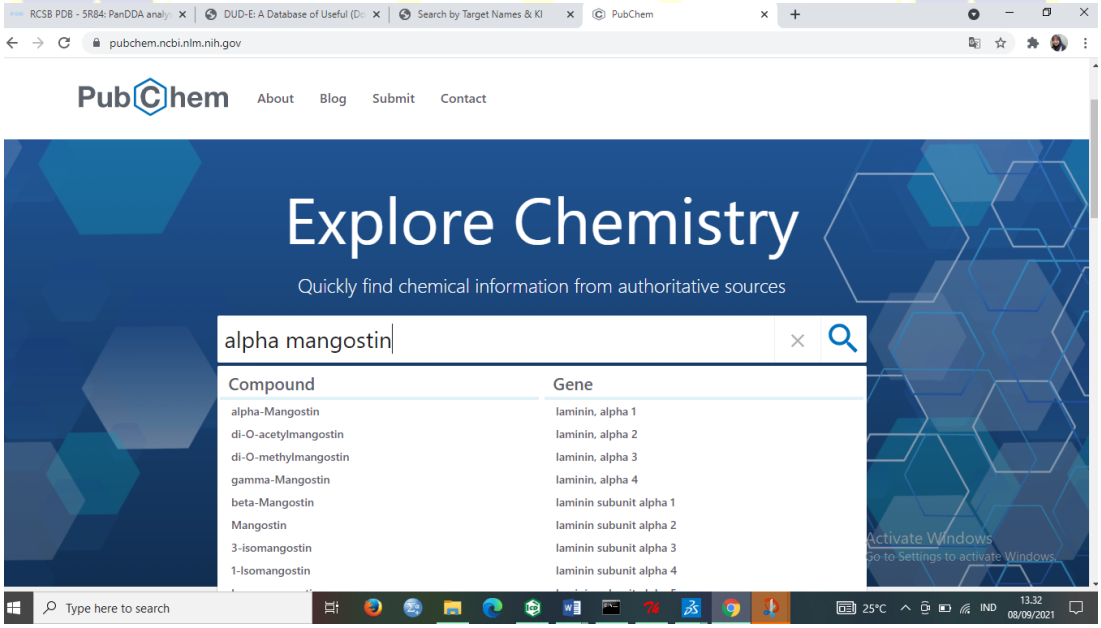
Gambar IV.6 Tampilan situs DUD-E

LAMPIRAN 2

(LANJUTAN)



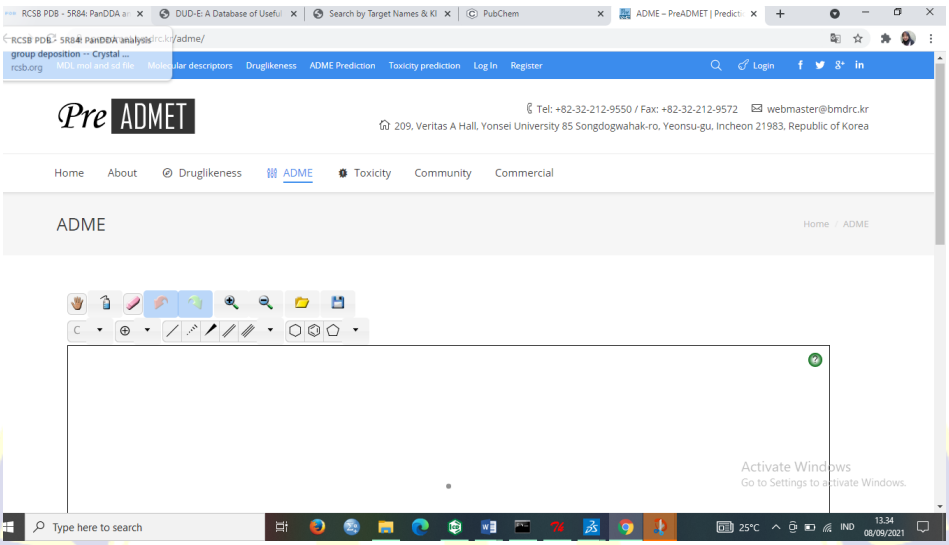
Gambar IV.7 Tampilan situs *Binding Database*



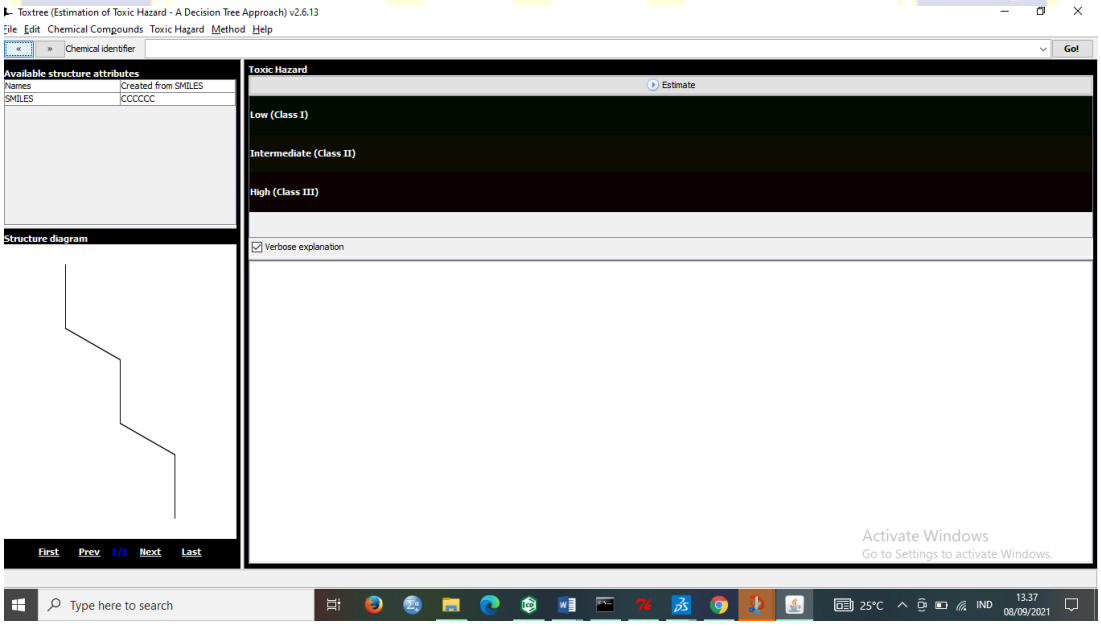
Gambar IV.8 Tampilan situs *PubChem*

LAMPIRAN 3

(LANJUTAN)



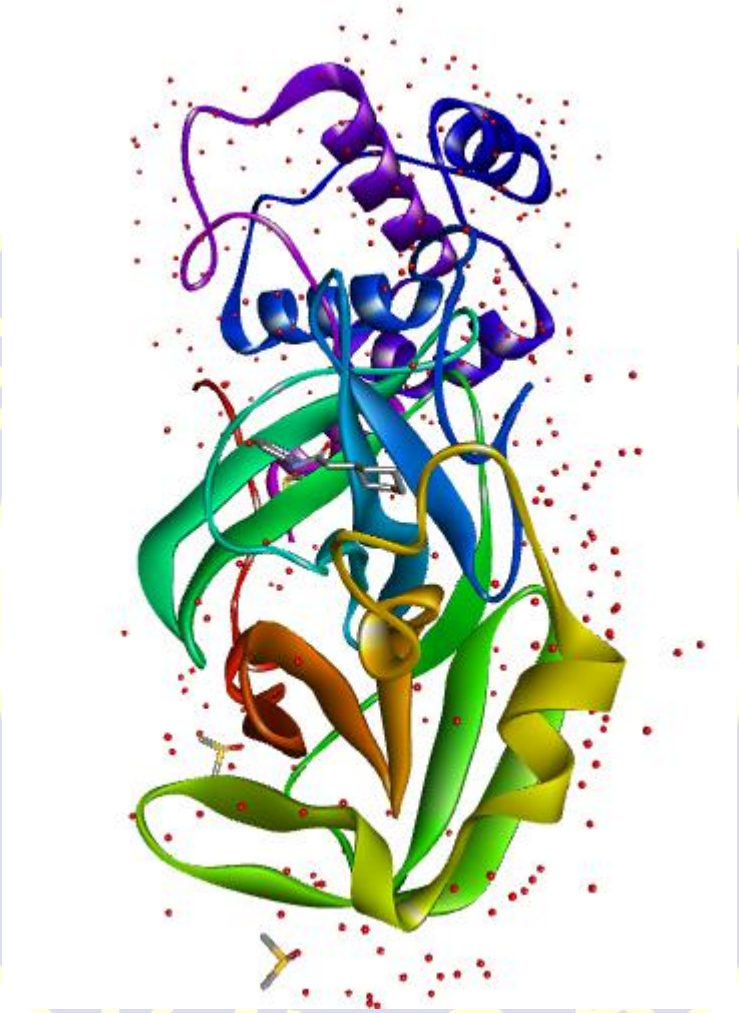
Gambar IV.9 Tampilan situs PreADMET



Gambar IV.10 Tampilan situs aplikasi *Toxtree*

LAMPIRAN 4

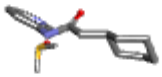
STRUKTUR 3 DIMENSI RESEPTOR MAIN PROTEASE DAN LIGAN ALAMI



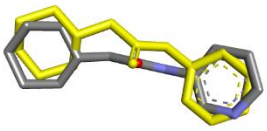
Gambar V.1 *Main Protease* 5R84

LAMPIRAN 4

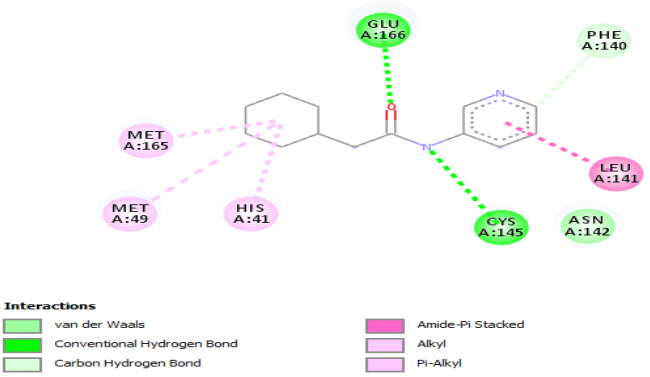
(LANJUTAN)



Gambar V.2 Ligan alami



Gambar V.3 Visualisasi tumpang tindih ligan alami 5R84 (merah-abu-biru) dengan hasil *redocking* (kuning)



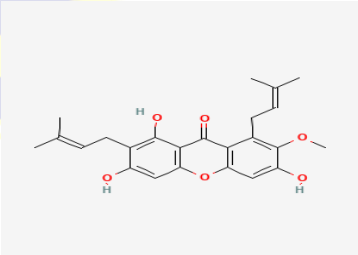
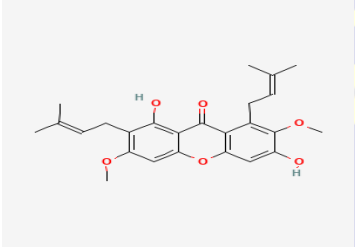
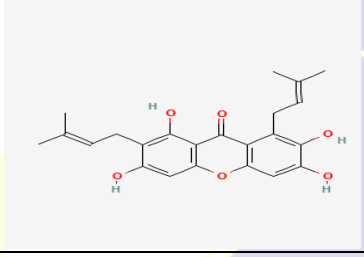
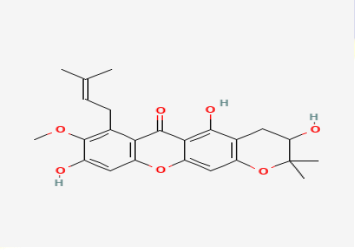
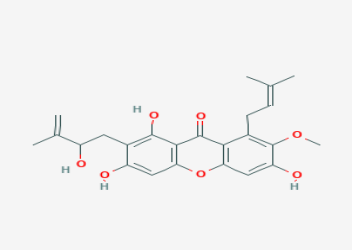
Gambar V.4 Residu asam amino

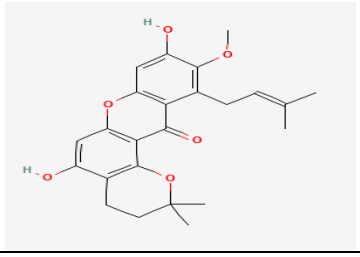
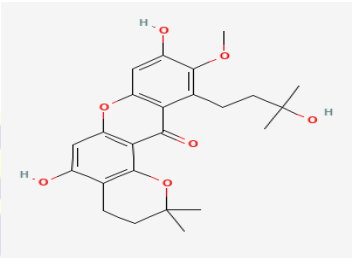
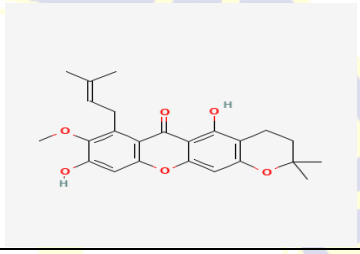
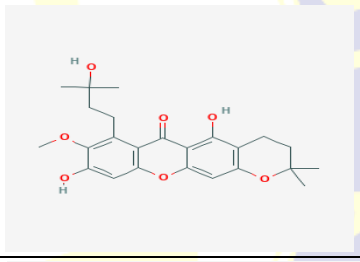
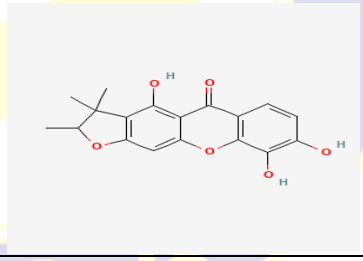
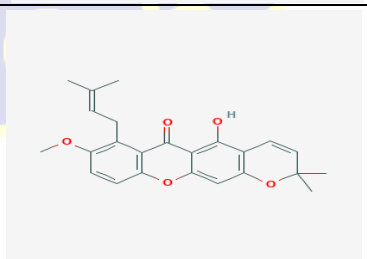
LAMPIRAN 5

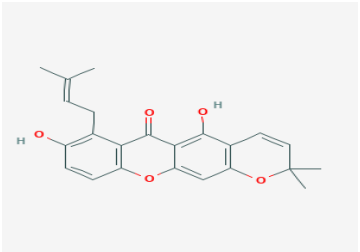
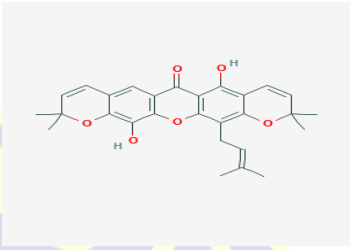
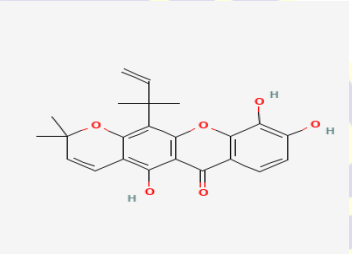
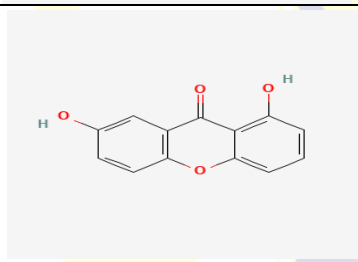
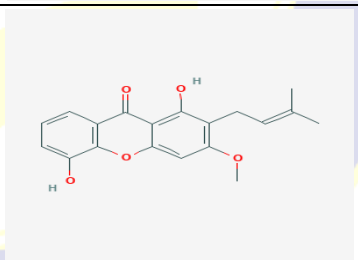
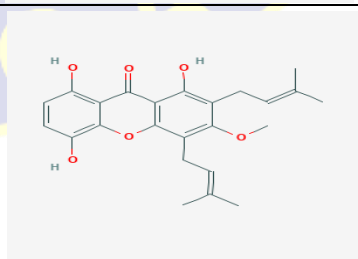
GAMBAR STRUKTUR LIGAN UJI

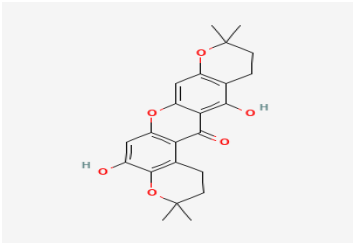
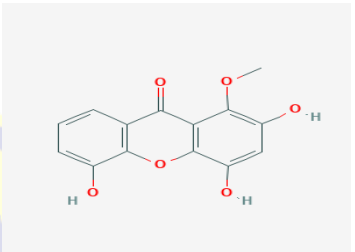
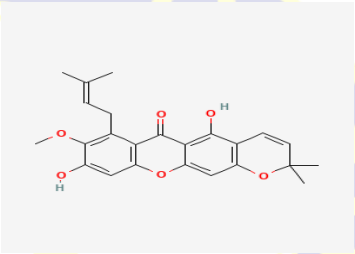
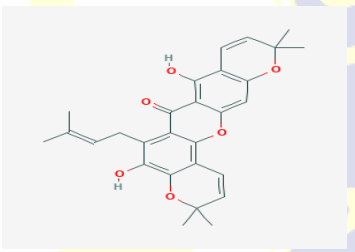
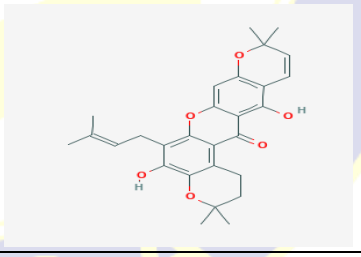
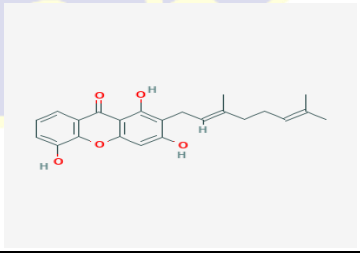
Tabel V.1

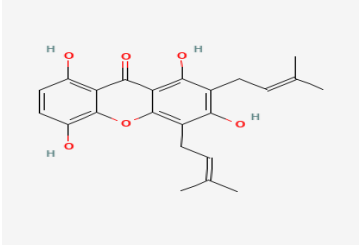
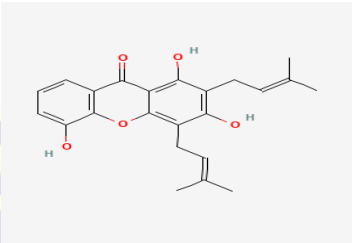
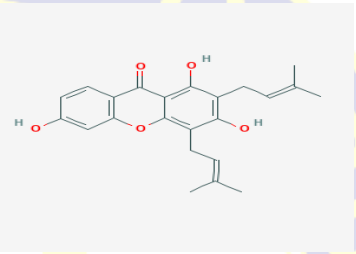
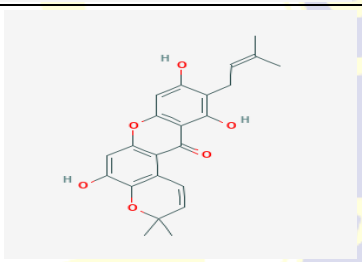
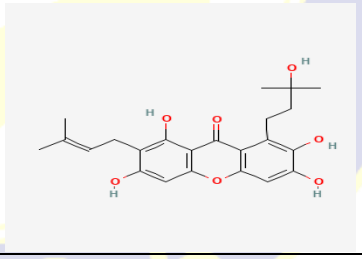
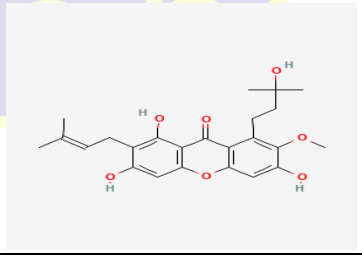
Senyawa yang Terdapat di Dalam Manggis (*Garcinia mangostana* L.)

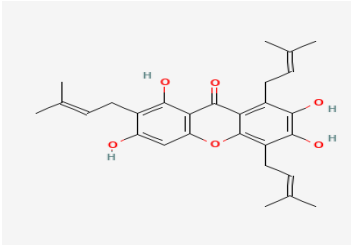
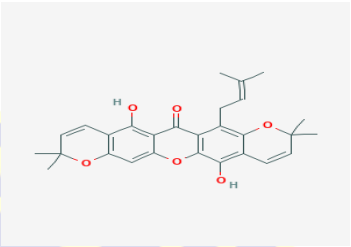
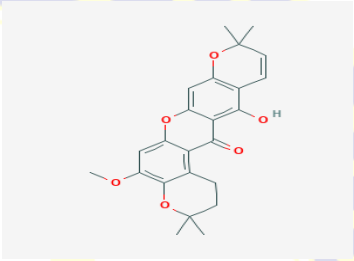
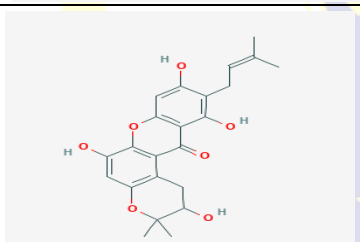
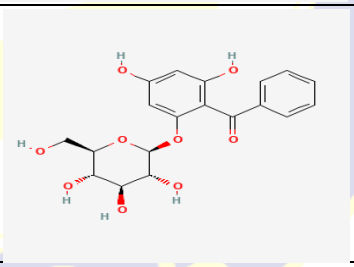
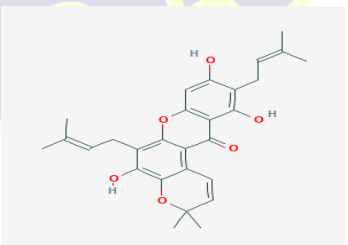
Nama Senyawa	Gambar Struktur
α-Mangostin	
β-Mangostin	
ϒ-Mangostin	
Mangostanol	
Mangostenol	

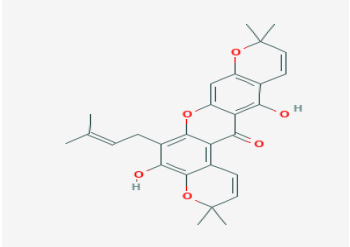
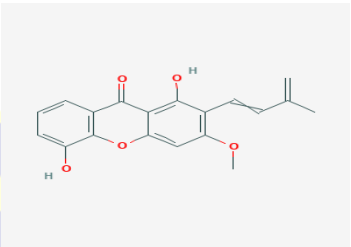
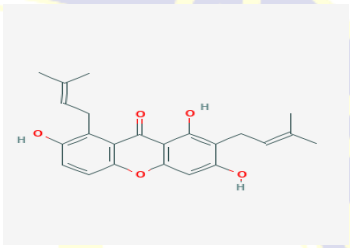
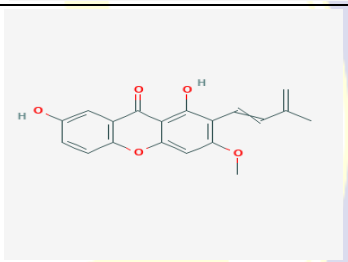
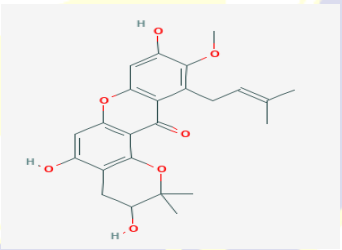
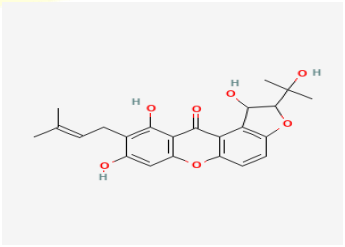
1-Isomangostin	
1-Isomangostin hydrate	
3-Isomangostin	
3-Isomangostin hydrate	
Toxyloxanthone	
Calabaxanthone	

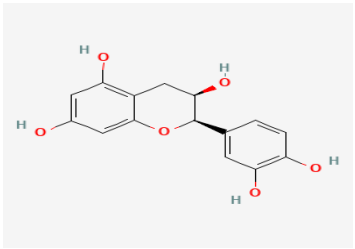
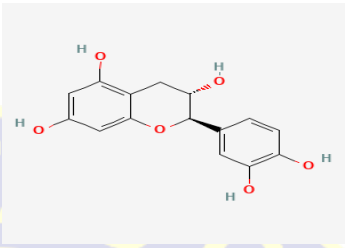
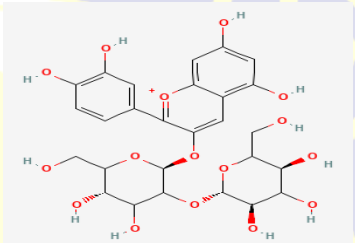
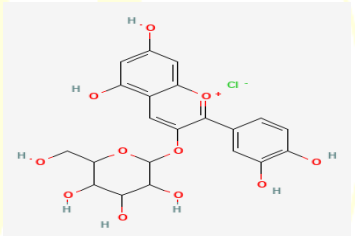
Demethylcalabaxanthone	
Caloxanthone	
Macluraxanthone	
1,7-dihydroxyxanthone (euxanthone)	
Cudraxanthone	
8-Hydroxycudraxanthone	

BR-xanthone A	
BR-xanthone B	
Mangostanin	
Mangostenone A	
Mangostenone B	
Mangostinone	

Gartanin	
8-Desoxygartanin	
Garcinone A	
Garcinone B	
Garcinone C	
Garcinone D	

Garcinone E	
Garcimangosone A	
Garcimangosone B	
Garcimangosone C	
Garcimangosone D	
Tovophyllin A	

Tovophyllin B	
1,5-dihydroxy-2-isoprenyl-3-methoxyxanthone	
6-Deoxy-gamma-mangostin	
1,7-Dihydroxy-2-isoprenyl-3-methoxyxanthone	
11-hydroxy-1-isomangostin	
1,2-dihydro-1,8,10-trihydroxy-2-(2-hydroxypropan-2-yl)-9-(3-methylbut-2-enyl)furo[3,2-a]xanthen-11-one	
Norathyriol	

Epicatechin	
Catechin	
Cyanidin 3-sophoroside	
Cyanidin 3-glucoside	

LAMPIRAN 6

PREDIKSI *DRUG LIKENESS* BERDASARKAN ATURAN *LIPINSKI'S RULE OF FIVE*

Tabel V.4

Hasil Prediksi Sifat Fisika Kimia dari Senyawa Uji

Nama Senyawa	BM (g/mol)	Ikatan Hidrogen		Log P	Keterangan
		Donor	Akseptor		
α-Mangostin	410.05	3	6	6.3	Tidak Memenuhi Syarat
β-Mangostin	424.05	2	6	6.6	Tidak Memenuhi Syarat
ϒ-Mangostin	396.04	4	6	5.9	Tidak Memenuhi Syarat
Mangostanol	426.05	3	7	4.7	**Memenuhi Syarat**
Mangostenol	426.05	4	7	5.2	Tidak Memenuhi Syarat
1-Isomangostin	410.05	2	6	5.1	Tidak Memenuhi Syarat
1-Isomangostin hydrate	428.05	3	7	3.8	Memenuhi Syarat
3-Isomangostin	410.05	2	6	5.7	Tidak Memenuhi Syarat
3-Isomangostin hydrate	428.05	3	7	4.3	**Memenuhi Syarat**
Toxyloxanthone	328.03	3	6	3.8	**Memenuhi Syarat**

Calabaxanthone	392.04	1	5	6	Tidak Memenuhi Syarat
Demethylcalabaxanthone	378.04	2	5	5.7	Tidak Memenuhi Syarat
Caloxanthone	460.05	2	6	6.6	Tidak Memenuhi Syarat
Macluraxanthone	394.04	3	6	5.3	Tidak Memenuhi Syarat
1,7-dihydroxyxanthone (euxanthone)	228.20	2	4	2.8	**Memenuhi Syarat**
Cudraxanthone	326.03	2	5	4.7	**Memenuhi Syarat**
8-Hydroxycudraxanthone	410.05	3	6	6.3	Tidak Memenuhi Syarat
BR-xanthone A	396.04	2	6	4.8	**Memenuhi Syarat**
BR-xanthone B	274.22	3	6	1.9	**Memenuhi Syarat**
Mangostanin	408.04	2	6	5.6	Tidak Memenuhi Syarat
Mangostenone A	460.05	2	6	6.6	Tidak Memenuhi Syarat
Mangostenone B	462.05	2	6	6.6	Tidak Memenuhi Syarat
Mangostinone	380.04	3	5	6.2	Tidak Memenuhi Syarat

Gartanin	396.04	4	6	5.9	Tidak Memenuhi Syarat
8-Desoxygartanin	380.04	3	5	6.3	Tidak Memenuhi Syarat
Garcinone A	380.04	3	5	6.3	Tidak Memenuhi Syarat
Garcinone B	394.04	3	6	5.3	Tidak Memenuhi Syarat
Garcinone C	414.04	5	7	4.6	**Memenuhi Syarat**
Garcinone D	428.05	4	7	4.9	**Memenuhi Syarat**
Garcinone E	464.05	4	6	7.9	Tidak Memenuhi Syarat
Garcimangosone A	460.05	2	6	6.6	Tidak Memenuhi Syarat
Garcimangosone B	408.04	1	5	5	**Memenuhi Syarat**
Garcimangosone C	412.04	4	7	4.4	**Memenuhi Syarat**
Garcimangosone D	392.04	6	9	0.7	**Memenuhi Syarat**
Tovophyllin A	462.05	3	6	7.2	Tidak Memenuhi Syarat
Tovophyllin B	460.05	2	6	6.6	Tidak Memenuhi Syarat

1,5-dihydroxy-2-isoprenyl-3-methoxyxanthone	324.03	2	5	4.8	**Memenuhi Syarat**
6-Deoxy-gamma-mangostin	380.04	3	5	6.3	Tidak Memenuhi Syarat
1,7-Dihydroxy-2-isoprenyl-3-methoxyxanthone	324.03	2	5	4.8	**Memenuhi Syarat**
11-hydroxy-1-isomangostin	426.05	3	7	4.2	**Memenuhi Syarat**
1,2-dihydro-1,8,10-trihydroxy-2-(2-hydroxypropan-2-yl)-9-(3-methylbut-2-enyl)furo[3,2-a]xanthen-11-one	412.04	4	7	4.2	**Memenuhi Syarat**
Norathyriol	260.20	4	6	2.1	**Memenuhi Syarat**
Epicatechin	290.27	5	6	0,5	**Memenuhi Syarat**
Catechin	290.27	5	6	0.5	**Memenuhi Syarat**
Cyanidin 3-sophoroside	611.05	11	15	0	Tidak Memenuhi Syarat
Cyanidin 3-glucoside	484.8	8	11	0	Tidak Memenuhi Syarat

Keterangan: BM (Berat molekul) <500 Dalton, Log P <5, Donor ikatan hidrogen <5 dan Akseptor ikatan hidrogen <10.