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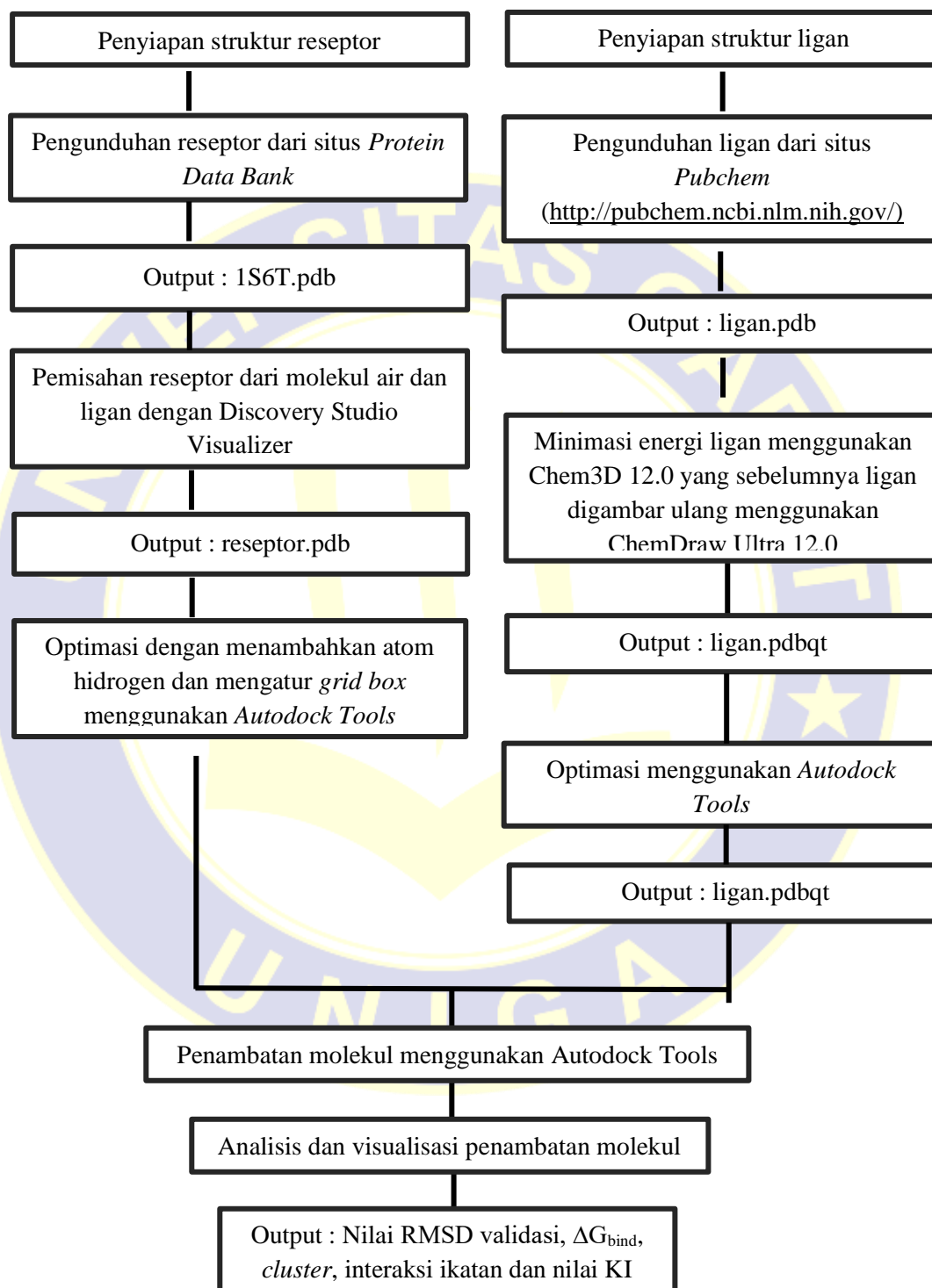
LAMPIRAN 1
SAMBILOTO (*Andrographis paniculata* Ness.)



Gambar 1.1 Sambiloto (*Andrographis paniculata* Ness.)

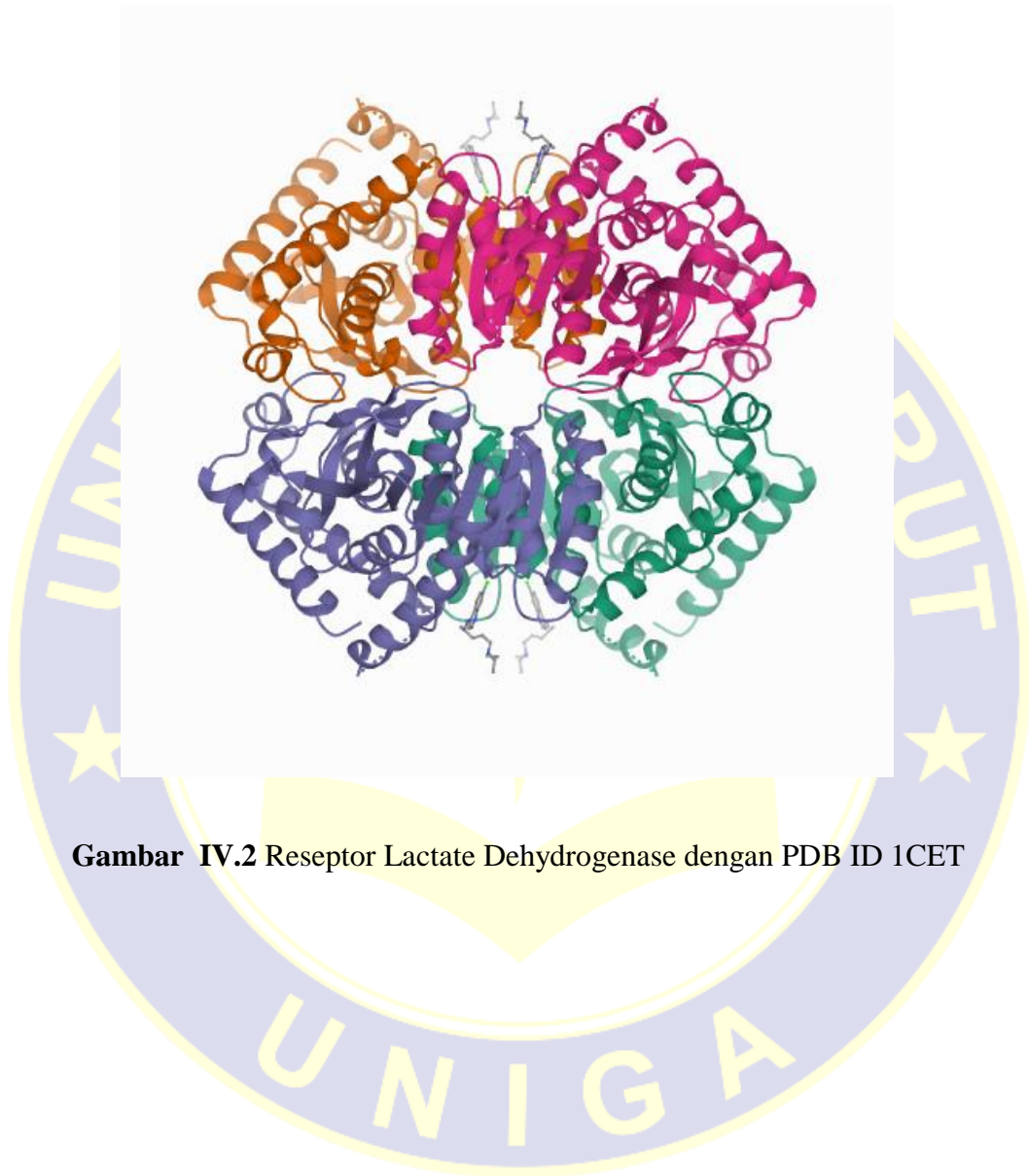
LAMPIRAN 2

ALUR PENELITIAN PENAMBATAN MOLEKUL

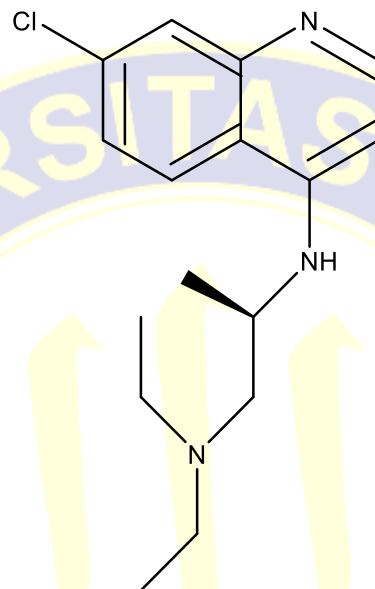


Tabel IV.1 Alur Penelitian Penambatan Molekul

LAMPIRAN 3
STRUKTUR 3D MAKROMOLEKUL

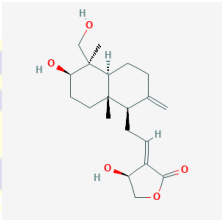
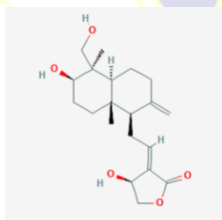
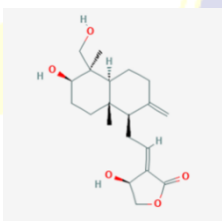
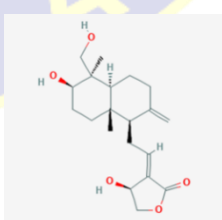


LAMPIRAN 4
STRUKTUR 2D LIGAN ALAMI

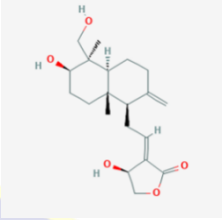
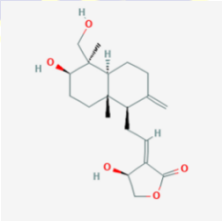
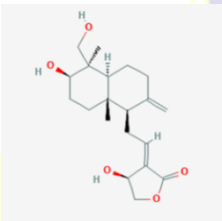
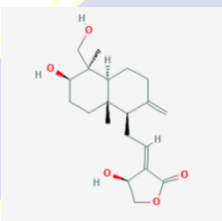


Gambar IV.3 Struktur 2D Ligan Alami

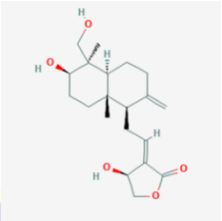
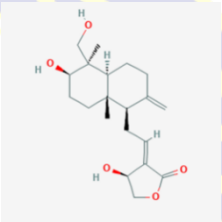
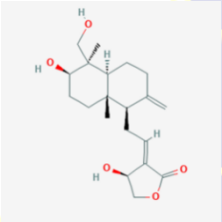
LAMPIRAN 5
STRUKTUR 2D LIGAN UJI

No.	Nama Ligan Uji	Struktur 2D
1.	Andrographolide	 <p>The image shows the 2D chemical structure of Andrographolide, a bicyclic sesquiterpene lactone. It features a decalin core with a methyl group at C-10, a vinyl group at C-8, and a lactone ring at C-11. The stereochemistry is defined with wedges and dashes: C-10 methyl is wedged, C-8 vinyl is wedged, C-11 lactone oxygen is wedged, and C-12 methyl is dashed.</p>
2.	Neoandrographolide	 <p>The image shows the 2D chemical structure of Neoandrographolide, which is a stereoisomer of Andrographolide. It has the same bicyclic core but with different stereochemistry: C-10 methyl is dashed, C-8 vinyl is dashed, C-11 lactone oxygen is dashed, and C-12 methyl is wedged.</p>
3.	14-Deoxyandrographolide	 <p>The image shows the 2D chemical structure of 14-Deoxyandrographolide, which is identical to Andrographolide but lacks the methyl group at C-14.</p>
4.	Andrograpanin	 <p>The image shows the 2D chemical structure of Andrograpanin, which is identical to Andrographolide but lacks the methyl group at C-10.</p>

**LAMPIRAN 5
LANJUTAN**

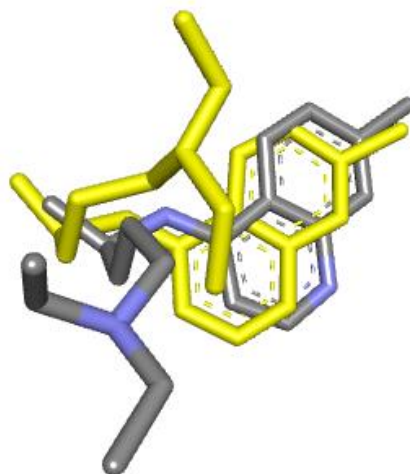
No.	Nama Ligan Uji	Struktur 2D
5.	Isoandrographolide	 <p>The image shows the 2D chemical structure of Isoandrographolide, a complex polycyclic compound with multiple stereocenters and a lactone ring.</p>
6.	5-Hydroxy-7,8,2'5' - Tetramethoxyflavone	 <p>The image shows the 2D chemical structure of 5-Hydroxy-7,8,2'5' - Tetramethoxyflavone, a flavone derivative with a hydroxyl group at position 5 and four methoxy groups at positions 7, 8, 2', and 5'.</p>
7.	5-Hydroxy-7,8-Dimethoxyflavone	 <p>The image shows the 2D chemical structure of 5-Hydroxy-7,8-Dimethoxyflavone, a flavone derivative with a hydroxyl group at position 5 and two methoxy groups at positions 7 and 8.</p>
8.	5-Hydroxy-7,8- Dimethoxyflavanone	 <p>The image shows the 2D chemical structure of 5-Hydroxy-7,8- Dimethoxyflavanone, a flavanone derivative with a hydroxyl group at position 5 and two methoxy groups at positions 7 and 8.</p>

**LAMPIRAN 5
LANJUTAN**

No.	Nama Ligan Uji	Struktur 2D
9.	14-Deoxy-11,12-Didehydro- Andrographolide	
10.	19-O-Acetyl-14-Deoxy-11,12- Didehydroandrographolide	
11.	14-Acetylandrographolide	

Gambar IV.4 Struktur 2D Ligan Uji

LAMPIRAN 6
VALIDASI METODE



Gambar V.1 Visualisasi tumpang tindih ligan alami dengan ligan hasil *redocking*

Tabel V.2 Hasil validasi metode dengan *redocking* ligan alaminya didapatkan nilai RMSD <math>< 2 \text{ \AA}</math> yaitu

Kode PDB	Grid Box	Tingkat Validasi	Validasi		Ikatan Energi (kkal/mol)
			RMSD CLUSTER (\AA)	RMSD Refernce (\AA)	
1CET	X: 36.211 Y: 10.539 Z: 19.83	2.500.000	0.00	1.688	-4.81

LAMPIRAN 7

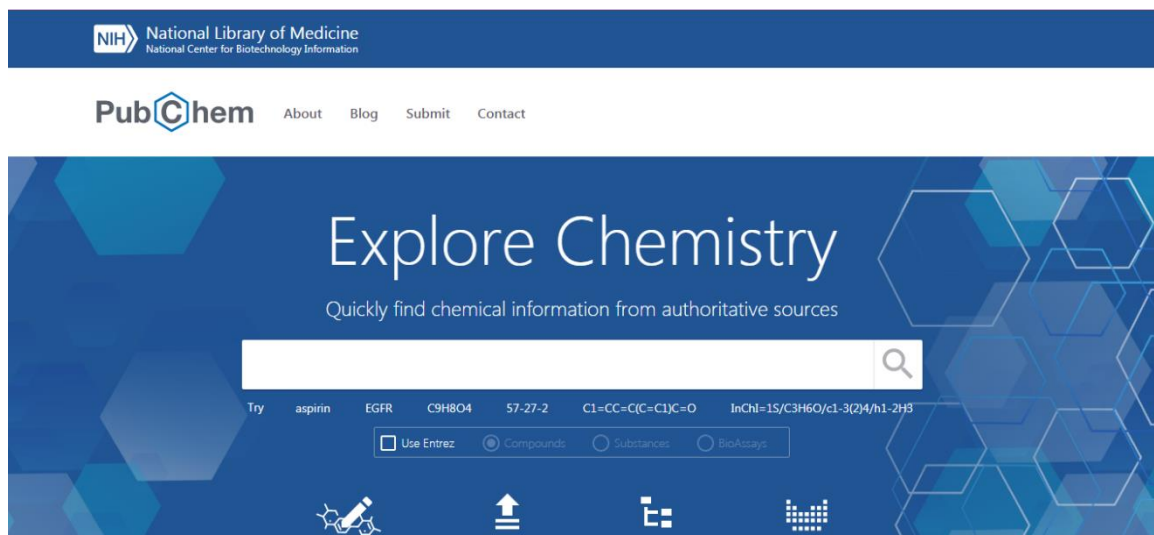
SITUS PROTEIN DATA BANK

The image shows the homepage of the Protein Data Bank (PDB). At the top, there is a navigation bar with links for 'RCSB PDB', 'Deposit', 'Search', 'Visualize', 'Analyze', 'Download', 'Learn', and 'More'. A search bar is located on the right side of the header. Below the navigation bar, the PDB logo is displayed, along with the text '167518 Biological Macromolecular Structures Enabling Breakthroughs in Research and Education'. A search bar with the placeholder text 'Enter search term(s)' is present. Below the search bar, there are logos for 'PDB-101', 'EM Data Resource', 'Molecular Biology Database', and 'Worldwide Protein Data Bank'. A sidebar on the left contains a 'Welcome' message and a list of navigation options: 'Deposit', 'Search', 'Visualize', 'Analyze', 'Download', and 'Learn'. The main content area features a section titled 'A Structural View of Biology' with a description of the resource and a link to 'COVID-19 CORONAVIRUS Resources'. To the right, there is a section titled 'August Molecule of the Month' featuring a 3D molecular model of a protein structure. A 'Contact Us' button is visible on the right side of the page.

Gambar IV.5 Tampilan situs *Protein Data Bank* (PDB) sebagai tempat pengunduhan reseptor.

LAMPIRAN 8

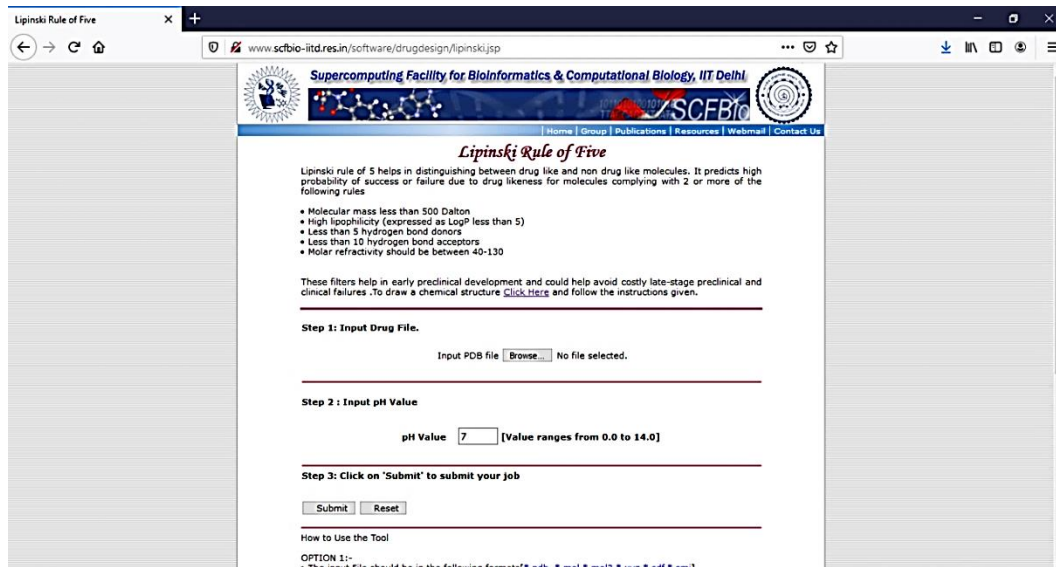
SITUS PUBCHEM



Gambar IV.6 Tampilan utama situs PubChem sebagai tempat pengunduhan beberapa senyawa dalam format .pdb

LAMPIRAN 9

SITUS LIPINSKI RULE OF FIVE

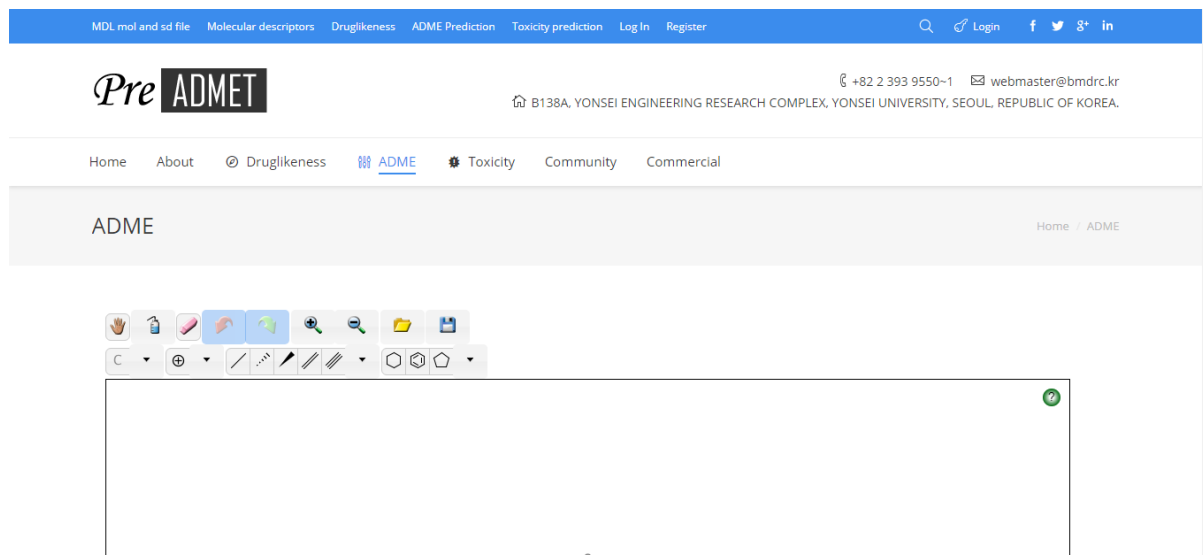


The screenshot shows a web browser window with the URL www.scfbio-iitd.res.in/software/drugdesign/lipinski.jsp. The page header includes the logo of the Supercomputing Facility for Bioinformatics & Computational Biology, IIT Delhi, and navigation links for Home, Group, Publications, Resources, Webmail, and Contact Us. The main content area is titled "Lipinski Rule of Five" and explains that the rule helps distinguish between drug-like and non-drug-like molecules. It lists five criteria: molecular mass less than 500 Dalton, high lipophilicity (LogP less than 5), less than 5 hydrogen bond donors, less than 10 hydrogen bond acceptors, and molar refractivity between 40-130. Below the text, there are three steps for using the tool: Step 1: Input Drug File, with a text input field and a "Browse..." button; Step 2: Input pH Value, with a text input field containing the value "7" and a note that the value ranges from 0.0 to 14.0; Step 3: Click on "Submit" to submit your job, with "Submit" and "Reset" buttons. At the bottom, there is a section titled "How to Use the Tool" and "OPTION 1:-" with a note about the input file format.

Gambar IV.7 Tampilan situs Lipinski rule of five untuk pengujian sifat fisikokimia

LAMPIRAN 10

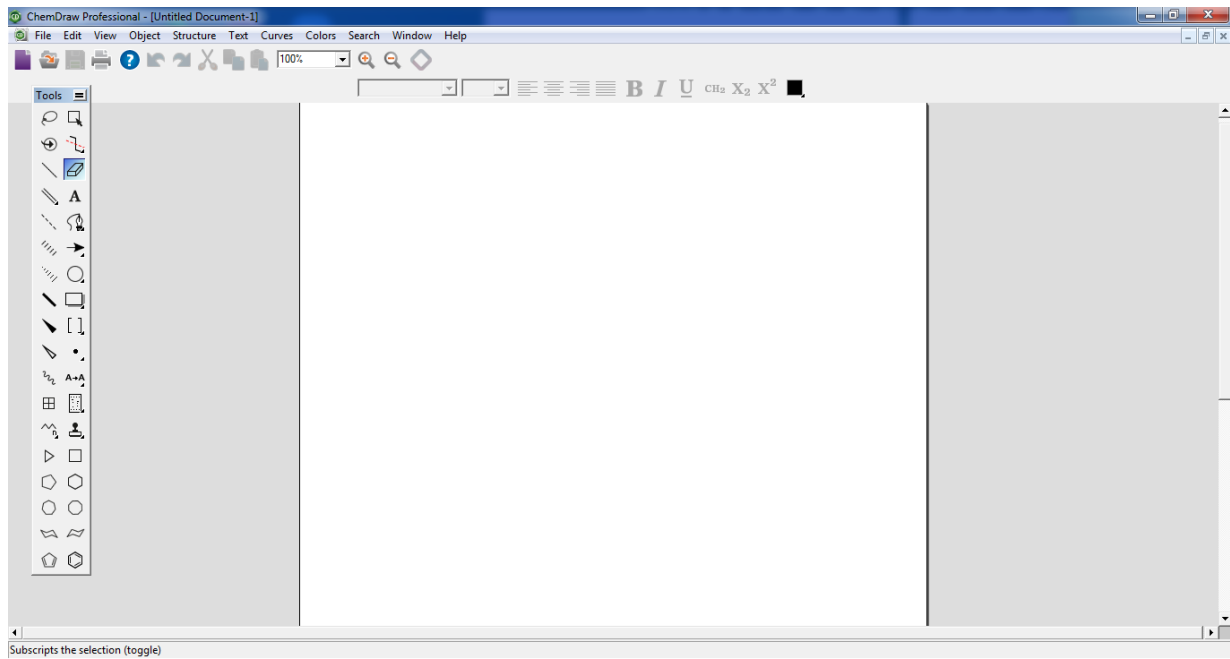
SITUS PREADMET



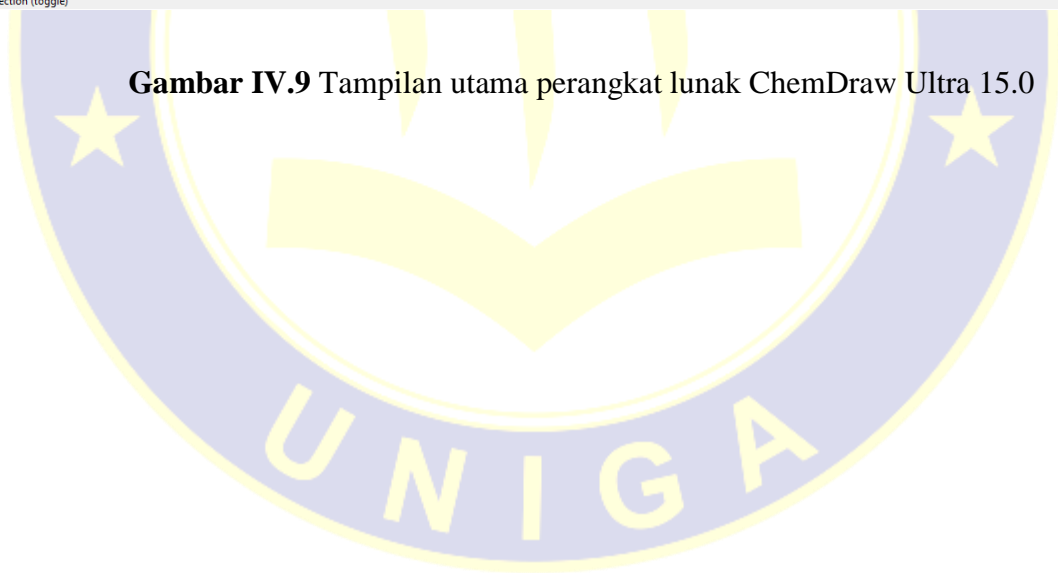
Gambar IV.8 Tampilan situs PreADMET

LAMPIRAN 11

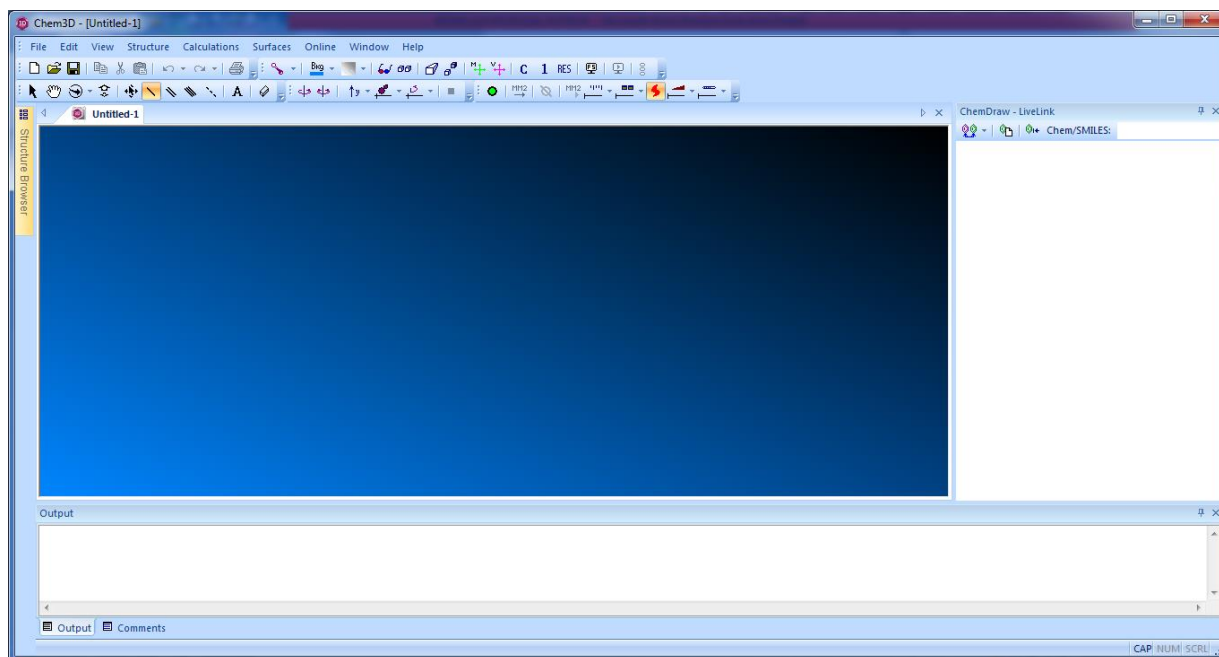
PERANGKAT LUNAK CHEMDRAW ULTRA 15.0



Gambar IV.9 Tampilan utama perangkat lunak ChemDraw Ultra 15.0



LAMPIRAN 12
PERANGKAT LUNAK CHEM3D PRO 12.0

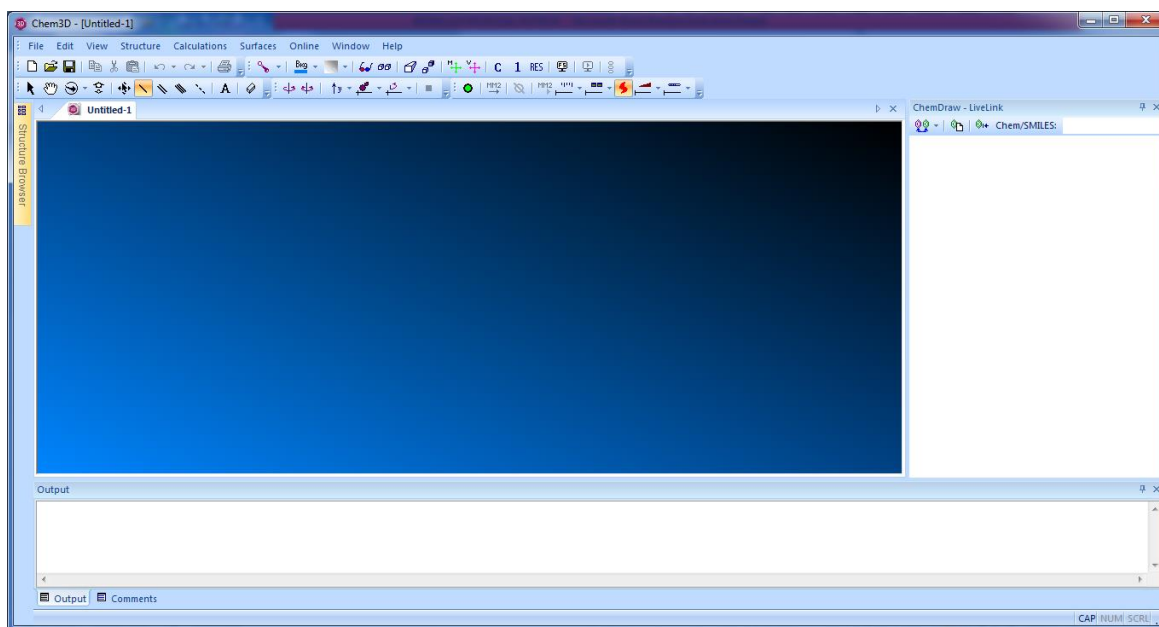


Gambar IV.10 Tampilan utama perangkat lunak Chem3D Pro 12.0

LAMPIRAN 13

PERANGKAT LUNAK DISCOVERY STUDIO VISUALIZER 2016

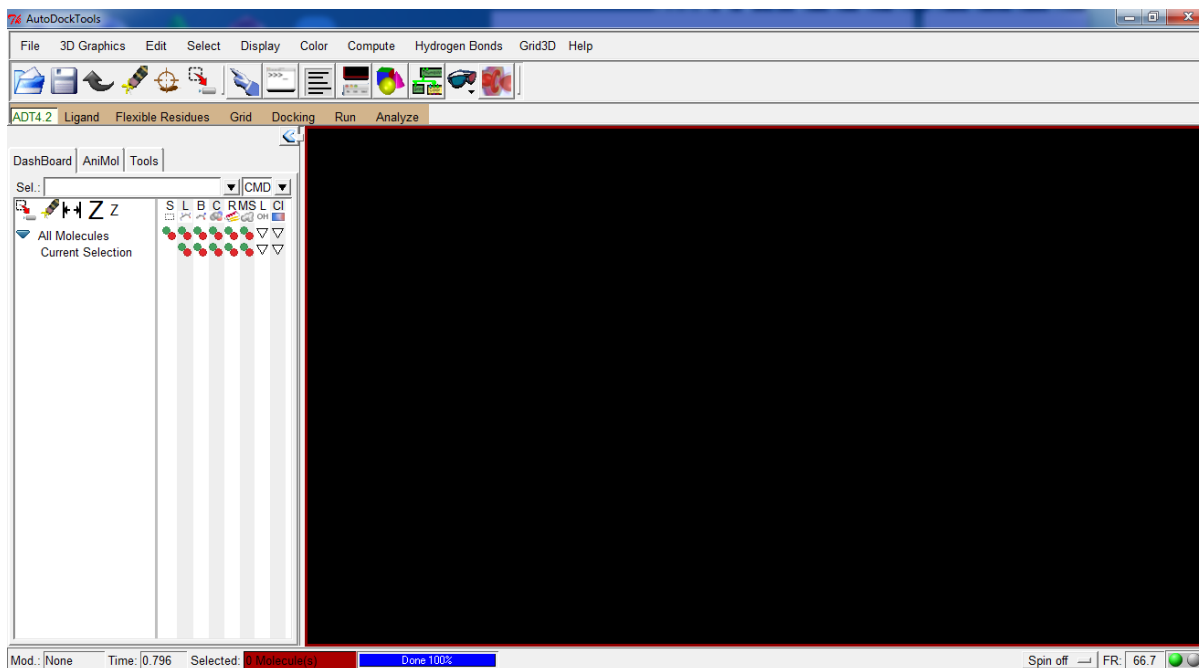
CLIENT



Gambar IV.11 Tampilan utama perangkat lunak *Discovery studio visualizer*

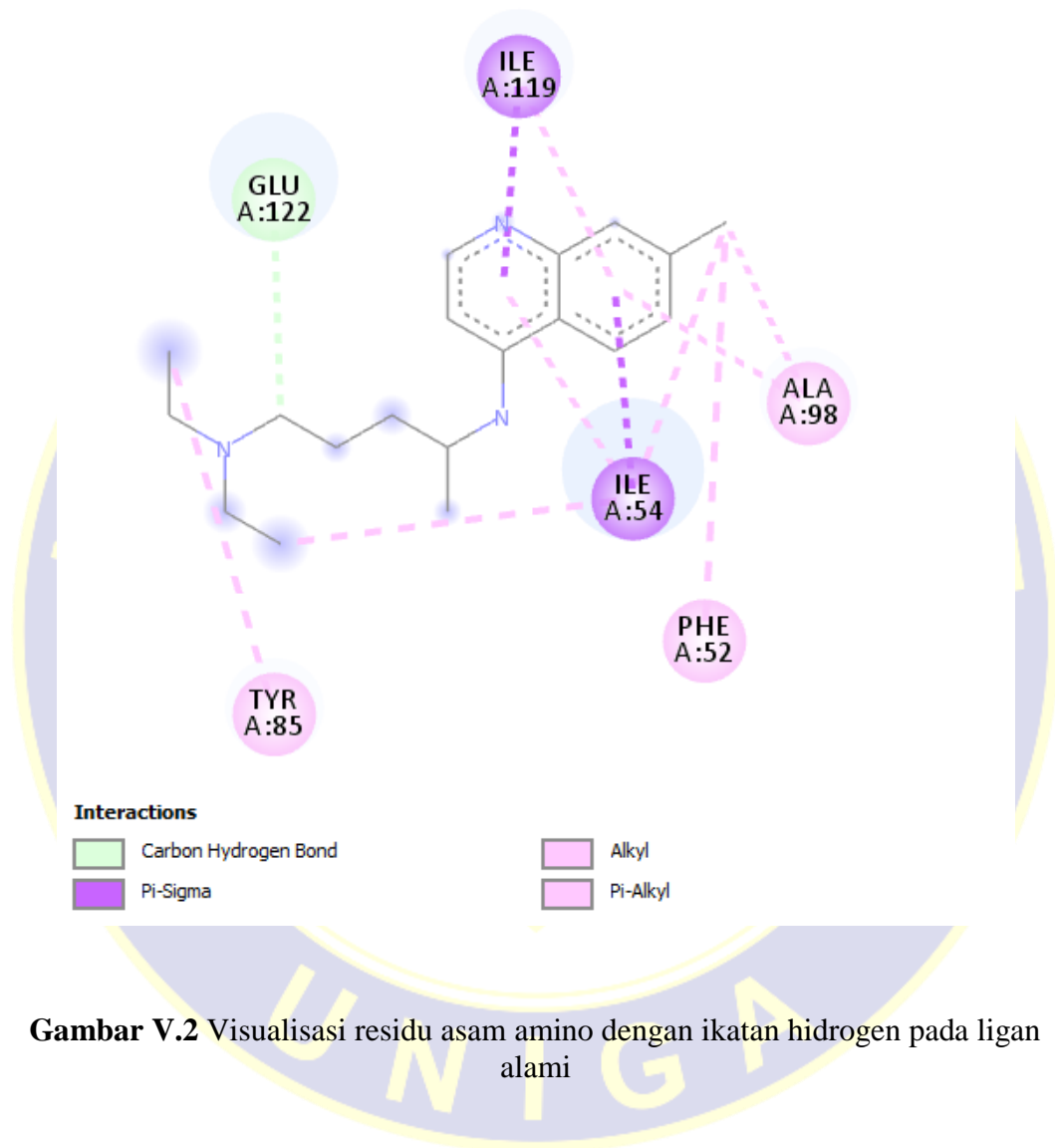
LAMPIRAN 14

PERANGKAT LUNAK AUTODOCK TOOLS

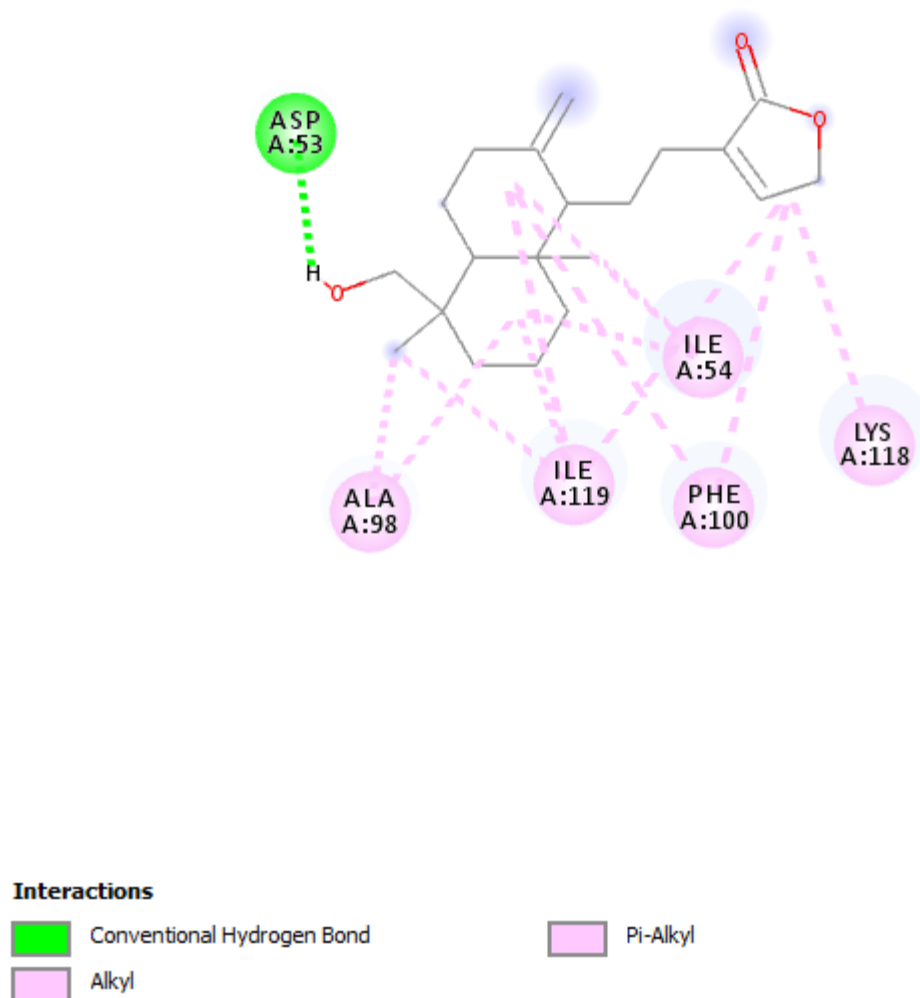


Gambar IV. 12 Tampilan perangkat lunak AutoDock Tools sebagai tempat penambatan molekul antara ligan dengan reseptor

LAMPIRAN 15

VISUALISASI PENAMBATAN MOLEKUL LIGAN ALAMI
DENGAN RESEPTOR

LAMPIRAN 16

VISUALISASI PENAMBATAN ANDROGRAPANIN DENGAN
RESEPTOR LACTASE DEHYDROGENASE

Gambar V.3 Tampilan visualisasi ikatan dan residu asam amino hasil penambatan molekul *Andrograpanin* dengan Reseptor

LAMPIRAN 17

HASIL PENAMBATAN MOLEKUL

Tabel V.3 Nilai Ikatan Energi dari Ligan Alami dan Senyawa Uji Pada Enzim Lactate Dehydrogenase

No	Senyawa /Ligan Uji	ΔG (kcal/ mol)	Jumlah Ikatan Hidrogen	Residu Asam Amino	KI
Ligan Alami					
	Ligan Alami	-4.81	1	GLU122	297.06 μM
Senyawa Aktif Sambiloto (<i>Andrographis paniculata</i> Ness.)					
1	Andrographolide	-5.32	1	GLU122	245.47 μM
2	Neoandrographolide	-4.93	2	GLU122, ASP53	245.41 μM
3	14-Deoxyandrographolide	-3.85	1	GLU122	1.51 mM
4	Andrograpanin	-6.78	1	ASP53	10.66 μM
5	Isoandrographolide	-2.07	1	GLY99	30.44 mM
6	5-Hydroxy-7,8,2'5'- Tetramethoxyflavone	-5.52	2	GLU122	90.41 μM
7	5-Hydroxy-7,8- Dimethoxyflavone	-5.74	1	TYR85, LYS118	62.52 μM
8	5-Hydroxy-7,8- Dimethoxyflavanone	-5.77	1	LYS118	59.46 μM
9	14-Deoxy-11,12-Didehydro- Andrographolide	-5.25	1	LYS118	142.03 μM

LAMPIRAN 17
(Lanjutan)

No	Senyawa /Ligan Uji	ΔG (kkal/ mol)	Jumlah Ikatan Hidrogen	Residu Asam Amino	KI
10	19-O-Acetyl-14-Deoxy-11,12-Didehydro-Andrographolide	-4.53	1	ASP53	476.84 μM
11	14-Acetylandrographolide	-4.46	-	-	400.07 μM

LAMPIRAN 18

SIFAT FISIKOKIMIA SENYAWA SAMBILOTO BERDASARKAN
LIPINSKI *RULE OF FIVE***Tabel V.4** Sifat Fisikokimia Senyawa yang Terkandung Didalam Daun Sirsak
Berdasarkan Aturan 5 Lipinski

No	Senyawa/Ligan uji	Bobot molekul (<500 Da)	Akseptor Hidrogen (<10)	Donor Hidrogen (<5)	Log P (<5)	Memenuhi/Tidak Memenuhi Syarat
1	Andrographolide	350.4 g/mol	5	3	2.2	Memenuhi Syarat
2	Neoandrographolide	480.6 g/mol	8	4	2.6	Memenuhi Syarat
3	14-Deoxyandrographolide	334.4 g/mol	4	2	3.4	Memenuhi Syarat
4	Andrograpanin	318.4 g/mol	3	1	4.2	Memenuhi Syarat
5	Isoandrographolide	350.4 g/mol	5	3	2.2	Memenuhi Syarat
6	5-Hydroxy-7,8,2'5'-Tetramethoxyflavone	358.3 g/mol	7	1	3.3	Memenuhi Syarat
7	5-Hydroxy-7,8-Dimethoxyflavone	298.29 g/mol	5	1	3.3	Memenuhi Syarat
8	5-Hydroxy-7,8-Dimethoxyflavanone	300.3 g/mol	5	1	3	Memenuhi Syarat
9	14-Deoxy-11,12-Didehydro-Andrographolide	332.4 g/mol	4	2	3.2	Memenuhi Syarat
10	19-O-Acetyl-14-Deoxy-11,12-Didehydroandrographolide	374.5 g/mol	5	1	3.3	Memenuhi Syarat
11	14-Acetylandrographolide	392.5 g/mol	6	2	2.7	Memenuhi Syarat

LAMPIRAN 19

HASIL UJI PREADMET (ABSORPSI DAN DISTRIBUSI)

Tabel V.5 Uji PreADME (Absorpsi dan Distribusi)

No	Nama Senyawa	Caco-2 cell (nm ^{sec-1})	HIA (%)	Protein Plasma Binding
1	Andrographolide	19.0405	88.332869	94.701705
2	Neoandrographolide	22.4103	95.366863	100.000000
3	14-Deoxyandrographolide	20.6118	92.673309	100.000000
4	Andrograpanin	22.4103	95.366863	100.000000
5	Isoandrographolide	19.488	91.737239	79.948049
6	5-Hydroxy-7,8,2'5'- Tetramethoxyflavone	41.0893	95.702075	96.792730
7	5-Hydroxy-7,8- Dimethoxyflavone	32.4067	95.507984	95.659075
8	5-Hydroxy-7,8- Dimethoxyflavanone	32.863	95.394426	98.757010
9	14-Deoxy-11,12-Didehydro- Andrographolide	20.6014	92.957025	98.430214
10	19-O-Acetyl-14-Deoxy-11,12- Didehydro-Andrographolide	20.6014	93.009504	100.000000
11	14-Acetylandrographolide	21.0616	92.894783	99.743427

Keterangan :

- % human intestinal absorption (% HIA) : 70-100% well absorbed (a),
20-70% moderately absorbed (b),
0-20% poorly absorbed (c);
- In Vitro Caco-2 cell permeability (nm sec-1) : > 70 higher permeability (a),
4-70 medium permeability (b),
<4 low permeability (c)
- % plasma protein binding : > 90% strongly bound (a),
<90% weakly bound (b).

LAMPIRAN 20
HASIL PENGUJIAN PREDIKSI TOKSISITAS

Tabel V.6 Uji Toksisitas

No	Nama Senyawa	Karsinogenik	Mutagenik
1	Andrographolide	Negative	Mutagenik
2	Neoandrographolide	Positive	Mutagenik
3	14-Deoxyandrographolide	Positive	Mutagenik
4	Andrograpanin	Negative	Non-Mutagenik
5	Isoandrographolide	Negative	Non-mutagen
6	5-Hydroxy-7,8,2'-5'- Tetramethoxyflavone	Negative	Mutagenik
7	5-Hydroxy-7,8- Dimethoxyflavone	Positive	Mutagenik
8	5-Hydroxy-7,8- Dimethoxyflavanone	Positive	Mutagenik
9	14-Deoxy-11,12-Didehydro- Andrographolide	Positive	Mutagenik
10	19-O-Acetyl-14-Deoxy-11,12- Didehydro-Andrographolide	Positive	Mutagenik
11	14-Acetylandrographolide	Positive	Mutagenik