Title of Research

Molecular Docking and Pharmacokinetic Studies of *Punica granatum* peel Phytocompounds to explore potential Antibacterial Activity

Author's Name and Affiliation

Amrullah Shidiki[1*]. Ashish Vyas[2]. Bijayraj Pandit[3]

1 National Medical College and Teaching Hospital, Birgunj, Nepal

2 Lovely Professional University, Phagwara, Punjab, India

3 The University of the West Indies, Trinidad and Tobago, West Indies

Background and Objective

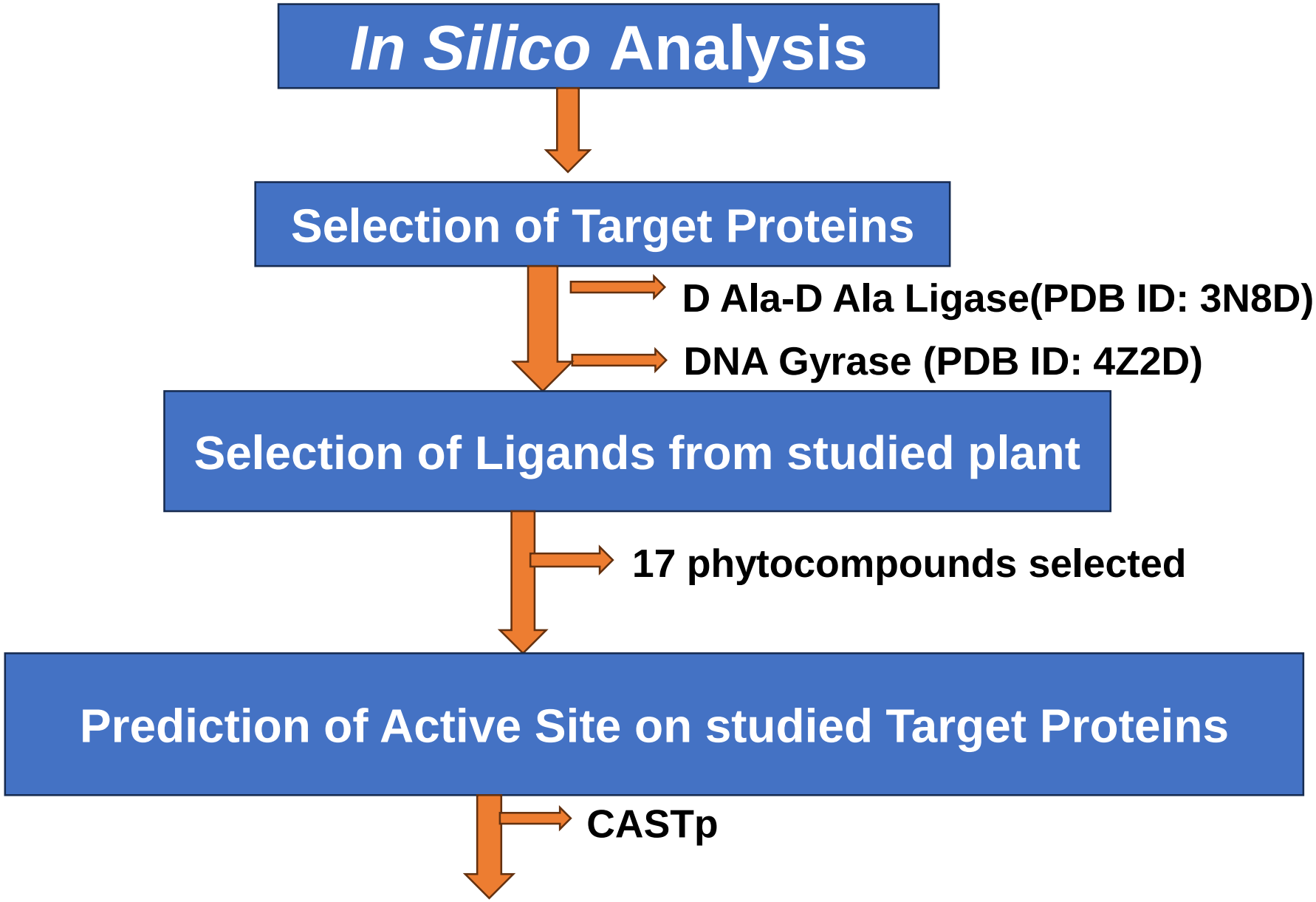
- **The continuous emergence of novel antibiotic resistance strains of bacteria make serious problem regarding management and treatment of infected individuals worldwide.**

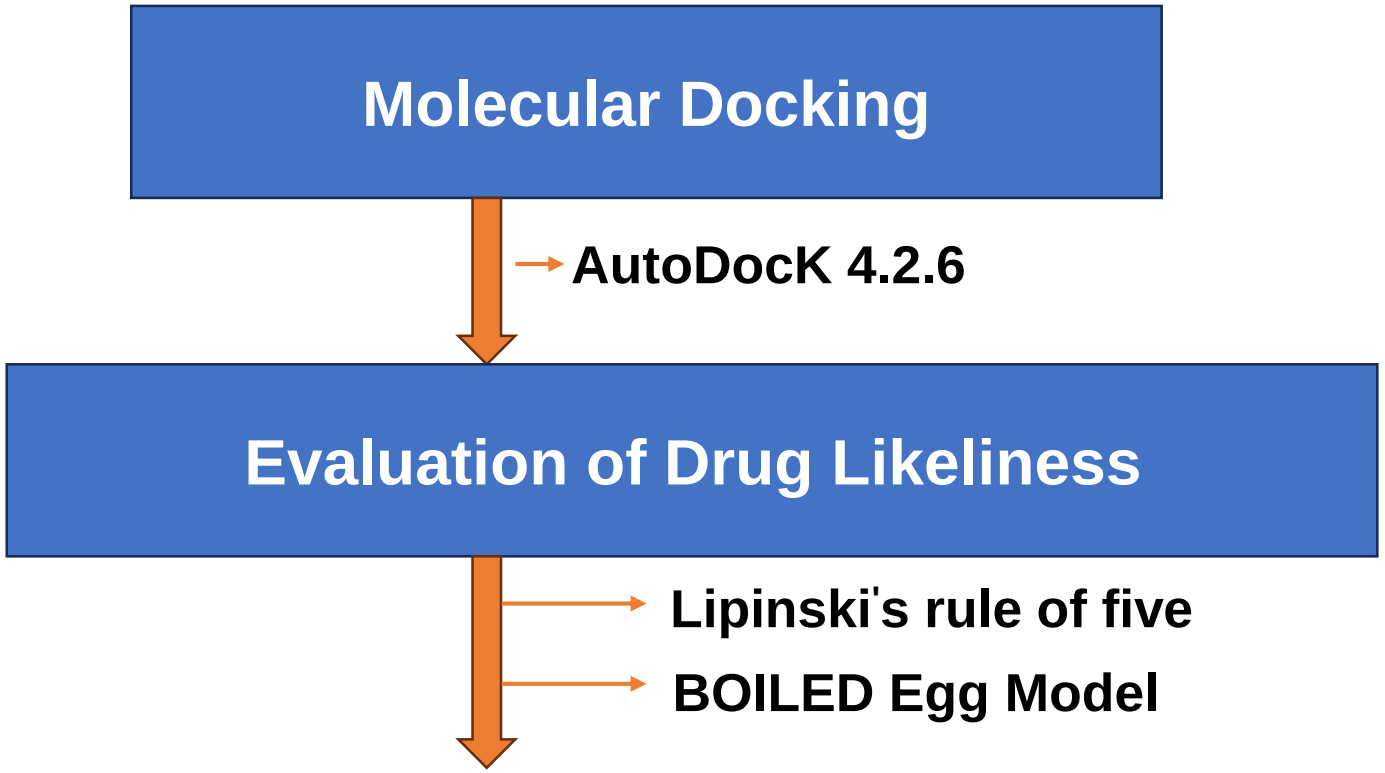
- **One study estimated about 700,000 people yearly were death and this will be increased to touch 10 million in the next three decades**

- **The plant *Punica granatum* is more well-known because it contain diverse array of phytocompounds demonstrates their therapeutic properties**

- **The objective is to analyze ADME characterization and docking of bioactive compounds of studied plant with two target proteins viz. D-alanine-D ligase from gram positive bacteria and DNA gyrase from gram-negative bacteria**

Methodology




Molecular Docking
AutoDocK 4.2.6
Evaluation of Drug Likeliness
Lipinski's rule of five
BOILED Egg Model

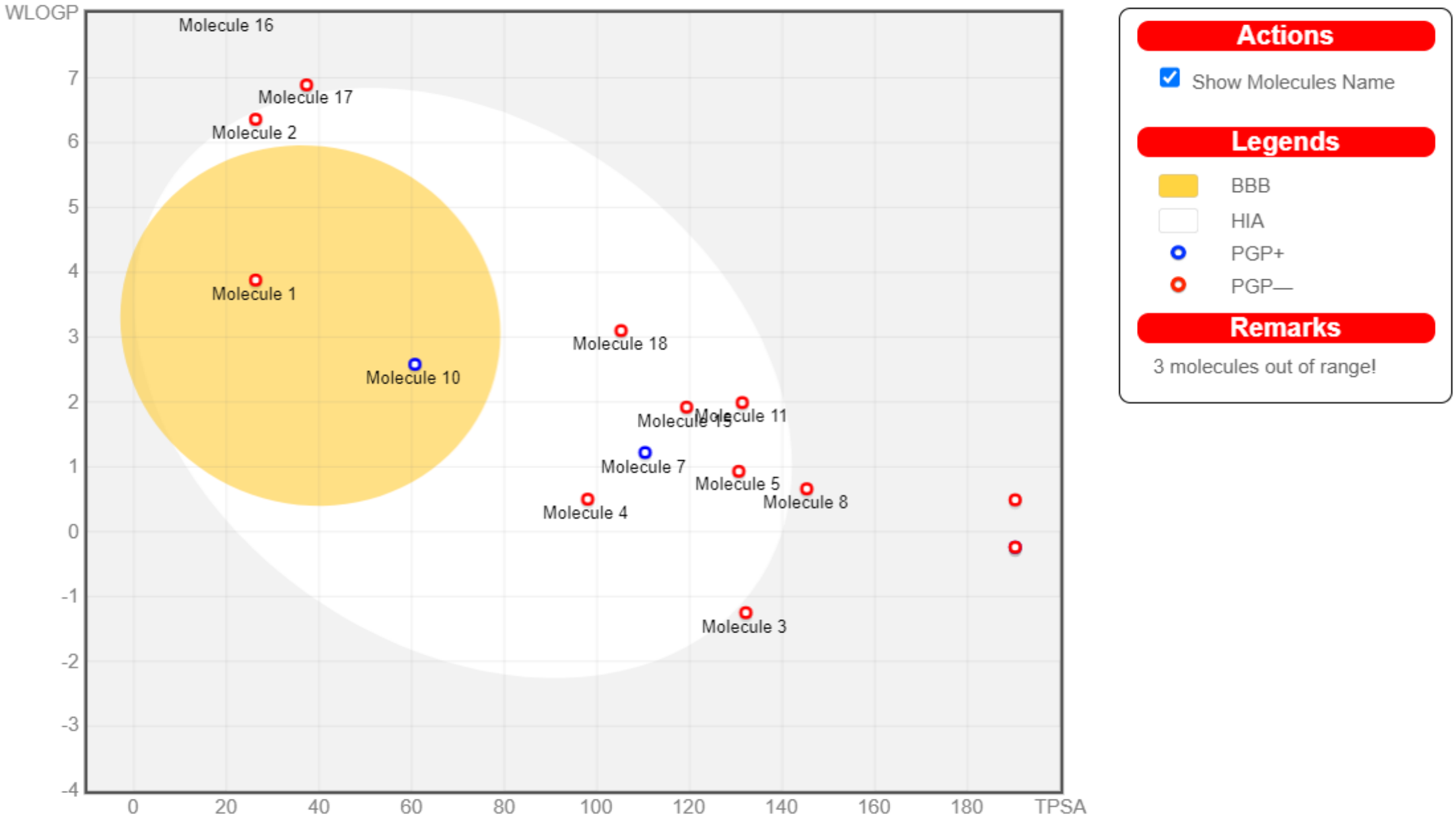
Results

➢ Docking Scores

S. No.	Ligands (Molecules)	Binding affinity (Kcal/mol) 3N8D	Binding affinity (Kcal/mol) 4Z2D
1.	Limonen -"6-ol", pivalate	-6	-5.5
2.	9-12-octadecadienoic acid, ethyl ester	-5.6	-5.1
3.	Citric acid	-5.8	-5.4
4.	Gallic acid	-5.9	-5.5
5.	Gallocatechin	-7.8	-7.4
6.	Granatin A	-9.9	-9.5
7.	Catechin	-8.7	-7.3
8.	Brevifolin carboxylic acid	-8.3	-7.1
9.	Dihydromyricetin 3-O-rhamnoside	-7.6	-7.7
10.	Estriol	-7.8	-7.3
11.	Quercetin	-8.5	-7.5
12.	Cynaroside	-8.2	-8.2
13.	Astragalin	-7.5	-8
14.	Quercitrin	-9.1	-7.7
15.	3,3'-Di-O-methylellagic acid	-8.1	-7.7
16.	Gamma sitosterol	-2.1	-1.6
17.	Gadoleic acid	-5	-3.6
18.	Tributyl acetyl citrate	-5	-5.6
19.	Vancomycin	8.7	-
20.	Levofloxacin	-	-7.6

➢ Lipinski properties of plant compounds analyzed by molinspiration

S. No.	Compound (Molecules)	Mol. Wt. (<500Da)	Log p (<5)	H-bond Donor (<5)	H-bond acceptor (<10)	TPSA <140
1	Limonen -"6-ol" ,pivalate	236	3.39	0	2	26.30
2	9-12 octadecadienoic acid,ethyl ester	308	5.03	0	2	26.30
3	Citric acid	192	-1.49	4	7	132.13
4	Gallic acid	170	0.21	4	5	97.99
5	Gallocatechin	306	0.98	6	7	130.61
6	Granatin A	800	0.56	12	23	383.49
7	Catechin	290	1.47	5	6	110.38
8	Brevifolin carboxylic acid	292	0.11	4	8	145.27
9	Dihydromyricetin 3-O-rhamnoside	466	1.30	8	12	206.60
10	Estriol	288	2.23	3	3	60.69
11	Quercetin	302	1.63	5	7	131.36
12	Cynaroside (Luteolin 7-O-glycoside)	448	1.83	7	12	190.28
13	Astragalin (Kaempferol 3-O-glucoside)	448	0.53	7	11	190.28
14	Quercetin 3-O-rhamnoside	448	1.27	7	11	190.28
15	3,3’-Di-O-methylellagic acid	330	1.90	2	8	119.34
16	Gamma sitosterol	414	4.79	1	1	20.23
17	Gadoleic acid	310	4.45	1	2	37.30
18	Tributyl acetylcitrate	402	4.58	0	8	105.20


WLOGP
TPSA
Molecule 16
Molecule 17
Molecule 2
Molecule 1
Molecule 10
Molecule 18
Molecule 15
Molecule 11
Molecule 7
Molecule 5
Molecule 8
Molecule 4
Molecule 3
7
6
5
4
3
2
1
0
-1
-2
-3
-4
0
20
40
60
80
100
120
140
160
180
Actions
Show Molecules Name
Legends
BBB
HIA
PGP+
PGP—
Remarks
3 molecules out of range!

Conclusion

The several antibiotics available are become fail to treatment of infectious diseases caused by antibiotic resistant strains of bacteria which leads to search of novel drug sources. The drug potentials from *Punica granatum* peel were studied by use of molecular docking to D-alanine-D alanine ligase (3N8D) from gram positive bacteria and DNA gyrase (4Z2D) from gram negative bacteria. Among compounds, granatin A, quercitrin, astragalin and cymaroside showed great binging affinity with 3N8D and 4Z2D. As a result, these molecules can be examined in more detail for in vitro research, which is a valuable tool for developing new medications for the treatment of bacterial infections.

Amrullah Shidiki, Ph.D.
Associate Professor, Department of Microbiology, National Medical College & Teaching Hospital, Birgunj, Nepal.
Connect With Amrullah on Social Media:
Gmail: amarullahsidhiqie24@gmail.com