

Contents

Title	Content	Pg.No.
	Declaration by Research Scholar–Originality of Research Work	I
	Certificate of Supervisor	II
	Declaration by Research Scholar – Submission of Thesis	IV
	Acknowledgement	V
	Contents	VI
	Abstract	X
Chapter: 1	Introduction & Literature Review	1
	1.1 Introduction of Heterocyclic compounds	1
	1.2 Historical background of Heterocyclic compounds	3
	1.3 Classification of Heterocyclic compounds	7
	1.4 Overview of Indole, Benzothiazole and Triazoles	13
	1.5 Advanced Computational Techniques in Medicinal Chemistry	24
	1.6 Literature review	29
Chapter: 2	Structure based design and virtual screening of indole scaffolds targeting Plasmodium falciparum: an experimental and computational approach for antimalarial drug discovery	73
	2.1 Introduction	73
	2.2. Result and Discussion	75
	2.2.1 Chemistry	75
	2.2.2 Malaria inhibitor prediction	77
	2.2.3 In vitro antimalarial screening	81
	2.2.4 Molecular modeling against PfDHFR	82
	2.3 Experimental section	87
	2.3.1 Chemistry	87
	2.3.2 Malaria inhibitor prediction	92
	2.3.3 In vitro antimalarial activity	92
	2.3.4 In silico activity against PfDHFR	93
	2.4 Conclusion	94
	2.5 Spectral data	95
Chapter: 3	Comprehensive Evaluation of Novel Compound Benzothiazole-Triazole: Inducing Cell Cycle Arrest,	116

Apoptosis, and Downregulating Bcl-2 Expression in Triple-Negative Breast Cancer Cells		
3.1	Introduction	116
3.2	results and discussion	119
3.2.1	Chemistry	119
3.2.2	Single-Dose Cytotoxicity Screening	121
3.2.3	In Vitro Cytotoxicity Assessment and Dose-Response Analysis	128
3.2.4	Cell Cycle Alterations Induced by Benzothiazole-Tethered Triazole Derivative	133
3.2.5	Induction of Apoptosis in MDA-MB-231 Cells	136
3.2.6	Fluorescence-Activated Cell Sorting (FACS)- Bcl-2 expression study	140
3.2.7	In silico Molecular Docking Studies on Bcl-2 Protein	142
3.2.8	Molecular Dynamics and MM-PBSA Analysis of 8a Interaction with Bcl-2	143
3.3	Material and methods	146
3.3.1	Chemistry	146
3.3.2	One-Dose Screening Assay Procedure	150
3.3.3	MTT Assay	151
3.3.4	Flow Cytometric Analysis of Cell Cycle	152
3.3.5	Annexin V Apoptosis Assay by Flow Cytometry	152
3.3.6	FACS-Bcl2 expression studies	153
3.3.7	Molecular docking procedure	154
3.3.8	Molecular dynamics simulation	155
3.4	Conclusion	155
3.5	spectral data	156
Chapter: 4	Synthesis and Evaluation of NH₂ and SH linker Free Benzothiazole-Triazole Compounds: Insights into Antimicrobial efficacy	173
4.1	Introduction	173
4.2	Result and discussion	175
4.2.1	Chemistry	175

4.2.2 In vitro antimicrobial activity evaluation and Structure Activity Relationship study (SAR)	179
4.2.3 Molecular docking studies	186
4.2.4 In silico Pharmacokinetic properties of selected compounds	193
4.3 Experimental	196
4.3.1 Materials and methods	196
4.3.2 In vitro antimicrobial and antifungal assay	203
4.3.3 Molecular modeling	206
4.3.4 In silico drug likeness analysis	207
4.4 Conclusion	207
4.5 Spectral data	208
Chapter: 5 Benzothiazole-Triazole Hybrids: Synthesis, Characterization, and Evaluation of Antidiabetic and Anticancer Activities	244
5.1 Introduction	244
5.2 Results and discussion	245
5.2.1 Chemistry	245
5.2.2 In vitro Antidiabetic evaluation of compound 10a-j	247
5.2.3 In vitro Anticancer Single Dose assay	250
5.3 Material and method	263
5.3.1 Chemistry	263
5.3.2 In vitro alpha amylase inhibition procedure	270
5.3.3 In vitro alpha glucosidase inhibition procedure	272
5.3.4 In vitro Anticancer Single dose assay procedure	273
5.4 Conclusion	273
5.5 Spectral data	274
Chapter: 6 Synthesis, Characterization, and Antimicrobial Properties of Indole-Tethered Benzothiazole and Triazole Hybrids	294
6.1 Introduction	294
6.2 Results and discussion	296
6.2.1 Chemistry	296
6.2.2 In vitro antimicrobial evaluation and structural activity relationship studies	297

6.2.3 In silico studies: Multi-target docking against C. albicans	300
6.2.4 Molecular dynamics against selected proteins	306
6.3 Material and methods	317
6.3.1 Chemistry	317
6.3.2 In vitro minimum inhibition concentration procedure	322
6.3.3 In silico Molecular docking method	323
6.3.4 Molecular dynamics simulation	324
6.4 conclusion	325
6.5 spectral data	326
Bibliography	342
Appendix A Plagiarism Report	375
Appendix B Publication	376