# Table of contents

## CHAPTER 1: INTRODUCTION

1.1 CANCER  
1.1.1: Conventional Treatment and its disadvantages  

1.2: DRUG DELIVERY SYSTEMS IN CANCER THERAPY  
1.2.1: NEED FOR TARGETED DELIVERY SYSTEMS  
1.2.2: DIFFERENT DELIVERY SYSTEMS  
1.2.2.1: Liposomes  
1.2.2.2: Microspheres  
1.2.2.3: Hydrogels  
1.2.2.4: Lipid emulsions  
1.2.2.5: Solid lipid nanoparticles  
1.2.2.6: Polymer  
1.2.3: POTENTIAL OF SYNTHETIC POLYMERS AS DRUG DELIVERY SYSTEMS  
1.2.4: TYPES OF POLYMERS USED AS DRUG DELIVERY SYSTEMS  
1.2.4.1: Linear polymers  
1.2.4.2: Copolymers  
1.2.4.3: Hyperbranched polymers  
1.2.4.4: Dendrimer-like polymers  
1.2.5: STRATEGIES FOR SYNTHESIS OF DENDRIMER-LIKE POLYMERS  
1.2.5.1: Divergent Synthesis  
1.2.5.2: Convergent Synthesis  
1.2.5.3: “Click” Synthesis  
1.2.6: POTENTIAL OF DENDRIMER-LIKE POLYMERS IN CANCER THERAPY  
1.2.6.1: Passive Targeting using Dendrimer-like polymers  
1.2.6.2: Active Targeting using Dendrimers-like polymers  
1.2.7: MECHANISMS OF DRUG LOADING ONTO DENDRIMER-LIKE POLYMERS  
1.2.7.1: Physical Encapsulation of Drug Molecules  
1.2.7.2: Chemical Conjugation of Drug Molecules
1.2.8: POTENTIAL of POLY (ETHYLENE OXIDE) AS A DELIVERY SYSTEM IN CANCER THERAPIES 34

1.3: ANTICANCER MOLECULES CHOSEN FOR THE STUDY
1.3.1: Doxorubicin delivery in cancer therapy 35
1.3.2: Lupeol from aloe vera : Anti-cancerous bioactive molecule 36

CHAPTER 2: SYNTHESIS OF BOUQUET TYPE SECOND GENERATION DENDRIMERS-LIKE POLYMERS 38
2.1: INTRODUCTION 39
2.2: MATERIALS AND METHODS 40
2.2.1: Materials and instrumentation 40
2.2.2: Polymer synthesis 40
2.2.2.1: Synthesis of bouquet type dendrimer-like polymers with methoxy PEG (mPEG) as core 40
2.2.2.2: Synthesis of bouquet type dendrimer-like polymers with 3,3-diethoxy 1,2-propanediol as core 41
2.3: RESULTS AND DISCUSSION 43

CHAPTER 3: ISOLATION AND PURIFICATION OF LUPEOL FROM ALOE VERA 60
3.1: INTRODUCTION 61
3.2: MATERIALS AND METHODS 64
3.2.1: Materials and instrumentation 64
3.2.2: Methods 65
3.2.2.1: Plant material 65
3.2.2.2: Preparation of crude extract 65
3.2.2.3: Qualitative analysis of the crude extract for lupeol 66
3.2.2.4: Two step purification of lupeol from crude extract 66
3.3: RESULTS AND DISCUSSION 68
CHAPTER 4: SYNTHESIS AND BIOLOGICAL CHARACTERIZATION OF DRUG-DENDRIMER CONJUGATES

4.1: INTRODUCTION 75

4.2: MATERIALS AND METHODS 78

4.2.1: Materials 78

4.2.2: Synthesis Drug-dendrimer conjugates 78

4.2.2.1: Synthesis of non-targeted drug-dendrimer conjugates 78

4.2.2.1.1: Coupling of lupeol to mPEG(G2)(Cl)₄ dendrimer 78

4.2.2.1.2: Coupling of lupeol to acetal PEG(G2)(Cl)₈ dendrimer 78

4.2.2.1.3: Coupling of doxorubicin to mPEG(G2.5)(OH)₄ dendrimer 78

4.2.2.1.4: Coupling of doxorubicin to acetal PEG(G2.5)(OH)₈ dendrimer 79

4.2.2.2: Synthesis of targeted doxorubicin-dendrimer conjugates with folic acid as the targeting moiety 80

4.2.3: In vitro release studies 80

4.2.4: Biological characterization 81

4.2.4.1: Cell culturing and growth 81

4.2.4.2: Determination of cytotoxicity 81

4.2.4.2.1: MTT assay 81

4.3: RESULTS AND DISCUSSIONS 83

CHAPTER 5: CONCLUSION AND FUTURE PROSPECTS 108

APPENDIX

REFERENCES