# CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABBREVIATION</td>
<td>i</td>
</tr>
<tr>
<td>GENERAL REMARKS</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iv</td>
</tr>
</tbody>
</table>

## CHAPTER 1

**Introduction to Asymmetric Dihydroxylation, Hydrolytic Kinetic Resolution and Organocatalytic Aldol Reaction**

### 1.1 Asymmetric Dihydroxylation

1.1.1 Introduction 1

1.1.2 Empirical rules for predicting the face Selectivity 3

1.1.3 Reaction conditions 3

1.1.4 The substrate preferences of Cinchona alkaloids 4

### 1.2 Hydrolytic Kinetic Resolution (HKR)

1.2.1 Introduction 5

1.2.2 Preparation of Catalyst and General Experimental Consideration 7

### 1.3 Organocatalytic Aldol Reaction

1.3.1 Introduction to Organocatalysis 9

1.3.2 Proline a “Universal catalyst” 9

1.3.3 Proline-catalyzed Aldol reaction 10

1.3.4 Mechanism of Aldol reaction 11

1.3.5 Scope of the proline-catalyzed Aldol reaction 12

### 1.4 References 15
CHAPTER 2
Enantioselective synthesis of hydroxylated pyrans and pyrrolidine alkaloid

2.1 Section A: An Asymmetric Dihydroxylation route to (-) Bulgecinine

2.1.1 Introduction 20
2.1.2 Review of Literature 21
2.1.3 Present Work 27
2.1.4 Results and Discussion 27
2.1.5 Conclusion 29
2.1.6 Experimental Section 31
2.1.7 Spectra 41
2.1.8 References 51

2.2 Section B: Stereoselective Synthesis of Ophiocerins A and C

2.2.1 Introduction 53
2.2.2 Review of Literature 53
2.2.3 Present Work 59
2.2.4 Results and Discussion 59
2.2.5 Conclusion 63
2.2.6 Experimental Section 64
2.2.7 Spectra 74
2.2.8 References 89
CHAPTER 3

Studies towards the total synthesis of Pandangolide via Organocatalytic and Chiral Pool Approach

3.1 Section A: Attempted synthesis of Pandangolide using Organocatalytic Aldol Reaction

3.1.1 Introduction  
3.1.2 Present Work  
3.1.3 Results and Discussion  
3.1.4 Experimental Section  
3.1.5 Spectra  
3.1.6 References

3.2 Section B: Studies toward the total synthesis of Pandangolide via Chiral Pool Approach

3.2.1 Introduction  
3.2.2 Present Work  
3.2.3 Results and Discussion  
3.2.4 Experimental Section  
3.2.5 Spectra  
3.2.6 References
CHAPTER 4
Development of an organocatalytic approach to the synthesis of (2R,3S)-hexane-1,2,3,5-tetraol stereomers: Application to stereoselective synthesis of Botryolide E, Stagonolide C, 9-epi-Stagonolide C, Decarestrictine O, Ophiocerin A, B and C

4.1 Introduction 141
4.2 Review of Literature 143
4.3 Present Work 156
4.4 Results and Discussion 156
4.5 Conclusion 165
4.6 Experimental Section 167
4.7 Spectra 204
4.8 References 250

Curriculum Vitae 253