## Contents

### CHAPTER 1: Introduction

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Pyrazole</td>
<td>1. <strong>Pyrazole</strong> 1</td>
</tr>
<tr>
<td>1.1.1 Natural occurrence</td>
<td>2</td>
</tr>
<tr>
<td>1.1.2 Synthetic approach</td>
<td>3</td>
</tr>
<tr>
<td>1.1.3 Biological significance</td>
<td>4</td>
</tr>
<tr>
<td>1.1.4 1-Aryl-5-chloro-3-methyl-1H-pyrazole-4-carbaldehyde</td>
<td>5</td>
</tr>
<tr>
<td>1.1.4A Synthesis of 1-Aryl-5-chloro-3-methyl-1H-pyrazole-4-carbaldehyde</td>
<td>6</td>
</tr>
<tr>
<td>1.1.4B Reactions of 1-Aryl-5-Chloro-3-Methyl-1H-Pyrazole-4-Carbaldehyde</td>
<td>7</td>
</tr>
<tr>
<td>1.1.4C Therapeutically Active Derivatives of 1-Aryl-5-Chloro-3-Methyl-1H-Pyrazoles</td>
<td>8</td>
</tr>
<tr>
<td>1.2 Quinoline</td>
<td>9</td>
</tr>
<tr>
<td>1.2.1 Natural occurrence</td>
<td>10</td>
</tr>
<tr>
<td>1.2.2 Synthetic approach</td>
<td>11</td>
</tr>
<tr>
<td>1.2.3 Biological significance</td>
<td>12</td>
</tr>
<tr>
<td>1.2.4 Synthesis and reactions of 2-chloro-3-formyl quinoline</td>
<td>13</td>
</tr>
<tr>
<td>1.2.4A Synthesis of 2-chloro-3-formyl quinoline</td>
<td>14</td>
</tr>
<tr>
<td>1.2.4B Reactions of 2-chloro-3-formyl quinoline</td>
<td>15</td>
</tr>
<tr>
<td>1.2.4C Reactions of 2-chloro-3-formyl quinoline as per current green chemistry trends</td>
<td>16</td>
</tr>
<tr>
<td>1.2.4D 2-Chloro-3-formyl quinoline as therapeutic agents</td>
<td>17</td>
</tr>
<tr>
<td>1.2.5 2-Aryloxyquinoline</td>
<td>18</td>
</tr>
<tr>
<td>1.2.5A Synthesis, reactions and biological aspects of 2-aryloxyquinoline</td>
<td>19</td>
</tr>
<tr>
<td>1.3 Antimicrobial study</td>
<td>20</td>
</tr>
<tr>
<td>1.3.1 Pathogens</td>
<td>21</td>
</tr>
<tr>
<td>1.3.1A Bacterial pathogens</td>
<td>22</td>
</tr>
<tr>
<td>1.3.1B Fungal pathogens</td>
<td>23</td>
</tr>
<tr>
<td>1.3.2 Antimicrobial agents</td>
<td>24</td>
</tr>
<tr>
<td>1.3.3 Antimicrobial susceptibility testing</td>
<td>25</td>
</tr>
<tr>
<td>1.3.4 Broth dilution method</td>
<td>26</td>
</tr>
<tr>
<td>1.4 Present study</td>
<td>27</td>
</tr>
<tr>
<td>References</td>
<td>28</td>
</tr>
</tbody>
</table>

**References**: 30

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Introduction</td>
<td>63</td>
</tr>
<tr>
<td>2.2</td>
<td>Multicomponent reactions (MCRs)</td>
<td>63</td>
</tr>
<tr>
<td>2.3</td>
<td>Chromene</td>
<td>65</td>
</tr>
<tr>
<td>2.3.1</td>
<td>Synthetic and biological significance of chromene</td>
<td>66</td>
</tr>
<tr>
<td>2.4</td>
<td>Pyran</td>
<td>72</td>
</tr>
<tr>
<td>2.4.1</td>
<td>Synthetic and biological aspects</td>
<td>73</td>
</tr>
<tr>
<td>2.5</td>
<td>Present study</td>
<td>74</td>
</tr>
<tr>
<td>2.5.1</td>
<td>Experimental</td>
<td>76</td>
</tr>
<tr>
<td>2.5.2</td>
<td>Results and discussion</td>
<td>81</td>
</tr>
<tr>
<td>2.5.3</td>
<td>Antimicrobial and antimycobacterial activity</td>
<td>112</td>
</tr>
<tr>
<td>2.5.4</td>
<td>Conclusion</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>References</td>
<td>121</td>
</tr>
</tbody>
</table>

CHAPTER 3: Diversity-synthesis of novel pyrano[2,3-c]pyrazole derivatives at room temperature and their antimicrobial activity assess

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Introduction</td>
<td>128</td>
</tr>
<tr>
<td>3.2</td>
<td>Synthetic and Biological Significance of 1,4-dihydro pyrano[2,3-c]pyrazole derivatives</td>
<td>128</td>
</tr>
<tr>
<td>3.3</td>
<td>Present study</td>
<td>134</td>
</tr>
<tr>
<td>3.3.1</td>
<td>Experimental</td>
<td>134</td>
</tr>
<tr>
<td>3.3.2</td>
<td>Results and discussion</td>
<td>137</td>
</tr>
<tr>
<td>3.3.3</td>
<td>Antimicrobial and antimycobacterial activity</td>
<td>162</td>
</tr>
<tr>
<td>3.3.4</td>
<td>Conclusion</td>
<td>168</td>
</tr>
<tr>
<td></td>
<td>Reference</td>
<td>169</td>
</tr>
</tbody>
</table>

CHAPTER 4 (Part-I): Synthesis and *in vitro* antimicrobial evaluation of new aryloxyquinoline based pyrido[1,2-a]benzimidazole derivatives

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Introduction</td>
<td>171</td>
</tr>
<tr>
<td>4.1.1</td>
<td>Biological aspects of benzimidazole</td>
<td>171</td>
</tr>
<tr>
<td>4.1.2</td>
<td>Biological aspects of pyridine</td>
<td>173</td>
</tr>
<tr>
<td>4.2</td>
<td>Present study</td>
<td>174</td>
</tr>
<tr>
<td>4.1.2.1</td>
<td>Experimental</td>
<td>176</td>
</tr>
<tr>
<td>4.1.2.2</td>
<td>Results and discussion</td>
<td>181</td>
</tr>
<tr>
<td>4.1.2.3</td>
<td>Antimicrobial activity</td>
<td>199</td>
</tr>
<tr>
<td>4.1.2.4</td>
<td>Conclusion</td>
<td>203</td>
</tr>
</tbody>
</table>
CHAPTER 4 (Part-II): Synthesis and in vitro antimicrobial evaluation of new aryloxypyrazole based pyrido[1,2-a]benzimidazole derivatives

4.II.2.1 Experimental ................................................................. 204
4.II.2.2 Results and discussion .................................................. 205
4.II.2.3 Antimicrobial activity .................................................... 218
4.II.2.4 Conclusion ................................................................. 222
References ................................................................. 223

CHAPTER 5 (Part-I): Microwave assisted synthesis and antimicrobial evaluation of new chromene derivatives bearing aryloxyquinoline nucleus

5.1 Introduction ................................................................. 225
5.1.1 Microwave assisted organic synthesis (MAOs) .................. 225
5.2 Present study ................................................................. 227
5.1.2.1 Experimental ........................................................... 229
5.1.2.2 Results and discussion ................................................ 231
5.1.2.3 Antimicrobial activity .................................................. 248
5.1.2.4 Conclusion ................................................................. 252

CHAPTER 5 (Part-II): Microwave assisted synthesis and antimicrobial evaluation of new chromene derivatives bearing aryloxypyrazole nucleus

5.II.2.1 Experimental ............................................................ 253
5.II.2.2 Results and discussion ................................................ 254
5.II.2.3 Antimicrobial activity .................................................. 267
5.II.2.4 Conclusion ................................................................. 271
References ................................................................. 272

Summary ................................................................. 273
Publications ............................................................. 279
Conferences .............................................................. 280