List of Figures

Figure 1.1   Epidemology of cancer in 2015.................................................................10
Figure 1.2 a α chain of jacalin amino acid sequence..............................................22
Figure 1.2 b β chain of jacalin amino acid sequence.............................................23
Figure 1.3   Crystal structure of jacalin.................................................................23
Figure 1.4   Crystal structure of jacalin complexed with (A) Galactose, (B) T antigen, (C) Porphyrin.................................................................26
Figure 2.1   Schematic representation of synthesis of cadmium sulfide quantum dots.................................................................35
Figure 2.2   Schematic representation of purification of jacalin from jackfruit seeds........................................................................38
Figure 2.3   Electron micrographs for CdS QDs.........................................................41
Figure 2.4   Characterisation of CdS QDs.................................................................42
Figure 2.5   UV and Fluorescence measurement of CdS QDs..................................43
Figure 2.6   Electrophoresis. (A) Native PAGE and (B) SDS-PAGE of jacalin...................44
Figure 2.7   Hameagglutination assay of jaclain with CdS QDs....................................45
Figure 2.8   Interaction of jacalin with CdS QDs.........................................................46
Figure 2.9   Determination of binding constant for jacalin- CdS QDs....................47
Figure 2.10  Van’t Hoff plot..................................................................................48
Figure 2.11  Synchronous spectra of jacalin-CdS QDs system........................................51
Figure 2.12  Determination of jacalin CdS QDs sugar binding activity....................52
Figure 2.13  Fluorescence imaging of Jac-CdS QDs with K562 and PBMC cells.................................................................53
Figure 3.1   Synthesis of sugar capped AgNPs..........................................................67
Figure 3.2   Characterisation of sugar capped AgNPs................................................67
Figure 3.3   Representative fluorescence titration. Jacalin fluorescence emission spectra monitored after addition of increasing concentrations of AgNPs.................................................................68
Figure 3.4 FTIR characterisation of jacalin and JAgNPs
Figure 3.5 Stern-Volmer plot for jacalin-AgNPs interaction
Figure 3.6 Determination of binding constant of jacalin interaction with AgNPs
Figure 3.7 Stability analysis of Gal-AgNPs after interaction with jacalin
Figure 3.8 Jacalin fluorescence spectra monitored after addition of increasing concentrations of (A) acetylshikonin and (B) β,β-dimethylacrylshikonin
Figure 3.9 Determination of binding constant of jacalin interaction with AS and BDS
Figure 3.10 Synthesis and characterisation of JAgNPs, AgJAS, AgJBDS
Figure 3.11 Determination of lectin activity
Figure 3.12 In vitro shikonin derivatives induced concentrations dependent and time dependent cell death of K562 cells
Figure 3.13 (A) In vitro cell viability of peripheral blood lymphocytes (B) Hemolytic activity of shikonin derivatives
Figure 3.14 Estimation of ROS
Figure 3.15 Estimation of mitochondrial membrane potential
Figure 3.16 Qualitative analysis of nuclear morphology
Figure 3.17 Analysis of apoptosis in K562 cells by Annexin V-FITC/PI
Figure 3.18 Shikonin derivatives induced caspase activation in K562 cells studied by ELISA
Figure 3.19 Shikonin derivatives induced alteration in cytokines expression
Figure 3.20 Drug uptake assay
Figure 4.1 Structure of the ruthenium complexes
Figure 4.2 Cytotoxicity of the ruthenium complex against K562 cells
Figure.4.3  Intercation of jacalin with ruthenium complexes..........................102
Figure.4.4  Stern-Volmer plot for jacalin binding to ruthenium
complexes........................................................................................................103
Figure.4.5  (A) Representative binding curve for the interaction of [Ru(phen)]Cl₂
with jacalin. (B) Analysis of the fluorescence titration with pheRu,
ppyRu, dppRu, and acdRu..................................................................................104
Figure.4.6  Haemagglutination assays of jacalin with
pheRu..................................................................................................................106
Figure.4.7  Synthesis and characterisation of JAgNPs- pheRu& JAgNPs-
ppyRu.................................................................................................................108
Figure.4.8  Drug release study at different pH...................................................109
Figure.4.9  Drug uptake assay.............................................................................110
Figure.4.10 MTT assay........................................................................................111
Figure.4.11 Determination of ROS.................................................................112
Figure.4.12 Qualitative determination of apoptosis in K562
cells......................................................................................................................113
Figure.5.1  (A)UV-visible spectra of (a) NLTA-CuNPs and (b) NLTA-CuS NPs.
(B) EDAX analysis.............................................................................................127
Figure.5.2  Characterisation of NLTA-CuS
NPs....................................................................................................................129
Figure.5.3  Interaction of jacalin with NLTA-
CuSNPs..........................................................................................................130
Figure.5.4  Determination of MIC.......................................................................131
Figure.5.5  ZOI of (A) CuS NPs and (B) JCuS NPs...........................................132
Figure.5.6  MBC evaluation for NLTA-
CuSNPs...........................................................................................................132
Figure.5.7  Scanning electron micrograph of E. Coli treated with
NLTA-CuS NPs................................................................................................134
Figure.5.8  Fluorescence microscopic images (A) E.coli and (B) B.
Subtilis..............................................................................................................135
Figure.5.9  Effect of CuS NPs on the formation of ROS in Gram
negative and Gram positive bacteria.................................................................136
Figure.5.10 Effect of CuS NPs (A) on MDA level and (B) intracellular
GSH level.............................................................................................................137
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.11</td>
<td>Injection Method. Bacterial colonies formed on LB-agar plate.</td>
</tr>
<tr>
<td>5.12</td>
<td>Bacterial colony count assay for medicated bath treatment.</td>
</tr>
<tr>
<td>5.13</td>
<td>Zebra fish infected with <em>A. hydrophila</em> was treated with medicated bath.</td>
</tr>
<tr>
<td>5.14</td>
<td>Liver carboxylesterase activity in zebrafish.</td>
</tr>
<tr>
<td>5.15</td>
<td>Microscopy image of human RBC.</td>
</tr>
<tr>
<td>5.16</td>
<td>Viable bacterial colonies present in water.</td>
</tr>
<tr>
<td>6.1</td>
<td>EDX spectrum showing the presence of elemental platinum.</td>
</tr>
<tr>
<td>6.2</td>
<td>TEM micrograph of (A) pecPtNPs and (B) JPtNPs.</td>
</tr>
<tr>
<td>6.3</td>
<td>MIC determination for <em>A. hydrophila</em> REMA assay.</td>
</tr>
<tr>
<td>6.4</td>
<td>In vitro antibacterial activity of JPtNPs.</td>
</tr>
<tr>
<td>6.5</td>
<td>Zone of inhibition at different volume of 0.05 mM JPtNPs.</td>
</tr>
<tr>
<td>6.6</td>
<td>Scanning electron microscopy image of <em>A. hydrophila</em>.</td>
</tr>
<tr>
<td>6.7</td>
<td>Membrane integrity study.</td>
</tr>
<tr>
<td>6.8</td>
<td>Hemocompatibility assay.</td>
</tr>
<tr>
<td>6.9</td>
<td><em>A. hydrophila</em> infected fish treated with multiple dose treatment of pecPtNPs.</td>
</tr>
<tr>
<td>6.10</td>
<td><em>In vivo</em> antibacterial activity of JPtNPs.</td>
</tr>
<tr>
<td>6.11</td>
<td>Gene expression.</td>
</tr>
<tr>
<td>6.12</td>
<td>Resensitization experiment.</td>
</tr>
<tr>
<td>6.13</td>
<td>Radial immuno assay.</td>
</tr>
<tr>
<td>6.14</td>
<td>Resensitization RIA.</td>
</tr>
</tbody>
</table>