CHAPTER 2. EXPERIMENTAL SETUP

2.1. Objectives of the Work

Oral sustained release drug delivery using microparticles preparation is nice option for the methodology expansion and upgrading purpose. A calcium channel blocker, Nifedipine and Diltiazem hydrochloride has found its applicability in such a life threatening cardiovascular diseases and widely used as an anti-anginal, anti-hypertensive and an anti-arrhythmic agent. When such active moieties given into conventional immediate releasing preparations, the frequency of administration increased up to twice-thrice time for one day because of shorter $t_{1/2}$.

Nifedipine is not soluble in aqueous media due to which absorption of Nifedipine depends on dissolution. So, it needs improvement in aqueous solubilization. In such a case, solid dispersed sustained release formulation will be beneficial than the immediate release dosage form as therapeutic level should maintain up to extended periods, eliminating maxima in its concentration commonly associated with multiple doses.

Ofloxacin is a fluoroquinolones antibacterial has an extensive range of bustle aligned with gram positive and negative bacteria. It utilized in diverse urinary and skin, gonorrhea, and respiratory infections. Normal dosage regimen varies from 200-600 mg administered twice or thrice a day, as per requirement. Its biological half-life is 5-6 hrs. In such a case, the sustained release formulation will be beneficial than the immediate release dosage form as therapeutic level managed for many hrs., eliminating maxima in concentration commonly associated with multiple doses.

This work was aimed to develop such controlled manner drug releasing system fit in the class of multiple unit matrix diffusion-controlled systems and diffusion reservoir and barrier kind of systems. The various areas of this study are:

- Exploring various hydrophilic polymers in different combination in demonstrating the ability to improve the solubility of drug.
- Identifying the optimum polymer effective concentrations that exhibit maximum water solubility of drug.
Chapter 2.

Experimental Setup

- Exploring polymer in different combination in demonstrating the ability retard drug release.
- Identifying the optimum polymer effective concentrations that exhibit maximum sustaining action of drug.
- To find out the effect of process parameters, that will subsequently employed in Fabrication, optimization as well as evaluation of economical formulation that does not required the use of costly polymers and solvents.
- To determine the consequences of process variables that will subsequently employed during formulation.
- Evaluate the comparative efficiency of polymer and gum on sustaining the release of active ingredients.
- Establish the relationship between drug retaining efficacies of the polymer.
2.2. PLAN OF WORK

- Literature Survey; the various work carried out on this topic is reviewed.
- Procurement of drug, polymer and other ingredients required for the study.
- Physical characterization of drug sample including
  - Description,
  - Melting point,
  - Solubility and recognition by U.V. spectrophotometer
- Analytical characterization of drug sample including -
  - Scanning of drug sample by U.V. spectroscopy.
  - To prepare calibration curve
- Study of interaction between drug and excipients by FTIR.
- Evaluations of the selected drug for:
  - Micromeric Properties
  - Bulk & Tap Densities and Flow Property
- Formulation of Solid Dispersions
- Evaluation of the prepared Solid Dispersions
  - Determination of solubility
  - Estimation of content
  - In vitro Dissolution of Solid Dispersion
  - Differential scanning calorimetry
  - Crystallinity Structure Characterization by XRD.
  - Analysis of Drug – Polymer Interactions by FIR Spectra.
- Formulation of Microparticles
- Evaluation of Microparticles
  - Bulk density
  - Tapped density
  - Angle of repose
  - Particle size distribution
  - % yield of microsphere formed
  - Drug entrapment efficiency
  - SEM
Chapter 2. Experimental Setup

- FTIR
- *In-vitro* Dissolution of microparticles
- Model Fitting
- Comparative evaluations of the marketed formulations for the same parameters with fabricated microparticles
- Accelerated stability study
2.3. Materials
All the chemicals used were of best quality available.

Table No. 2.1.1.

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Material</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Nifedipine</td>
<td>Cipla Ltd Goa.</td>
</tr>
<tr>
<td>2.</td>
<td>Diltiazem Hydrochloride</td>
<td>Themes laboratories, Ltd. Mumbai.</td>
</tr>
<tr>
<td>3.</td>
<td>Ofloxacin</td>
<td>Cipla Ltd Goa.</td>
</tr>
<tr>
<td>2.</td>
<td>Eudragit RS – 100</td>
<td>Rohm Pharma.</td>
</tr>
<tr>
<td>4.</td>
<td>Acetone</td>
<td>NiceChemicals Cochi.</td>
</tr>
<tr>
<td></td>
<td>Phosphate</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>n – Hexane</td>
<td>LOBA Mumbai.</td>
</tr>
<tr>
<td>8.</td>
<td>Concentrated (HCL)</td>
<td>LOBA Mumbai.</td>
</tr>
<tr>
<td>11.</td>
<td>Sodium Alginate</td>
<td>Thomas baker, Mumbai</td>
</tr>
</tbody>
</table>
## Experimental Setup

<table>
<thead>
<tr>
<th></th>
<th>Ingredient</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>HPMC</td>
<td>Colorcon. Goa.</td>
</tr>
<tr>
<td>13</td>
<td>Xanthan gum</td>
<td>Colorcon, Goa.</td>
</tr>
<tr>
<td>14</td>
<td>Calcium Chloride</td>
<td>Thomas baker Mumbai</td>
</tr>
<tr>
<td>15</td>
<td>Gelatin</td>
<td>LOBA Pvt. Ltd Mumbai.</td>
</tr>
<tr>
<td>16</td>
<td>Sodium Alginate</td>
<td>Thomas baker, Mumbai</td>
</tr>
<tr>
<td>17</td>
<td>Gaur Gum</td>
<td>Colorcon Asia Pvt. Ltd., Goa.</td>
</tr>
<tr>
<td>18</td>
<td>Glutaraldehyde</td>
<td>Thomas baker, Mumbai</td>
</tr>
<tr>
<td>19</td>
<td>Span 20</td>
<td>Thomas baker, Mumbai</td>
</tr>
<tr>
<td>20</td>
<td>Calcium Chloride</td>
<td>Thomas baker, Mumbai</td>
</tr>
</tbody>
</table>
### 2.4. List of Instruments and Equipments

**Table No. 2.1.2.**

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Name of Instruments</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Dissolution Test Apparatus (Type – 2), USP XXIX</td>
<td>ELECTROLAB</td>
</tr>
<tr>
<td>4.</td>
<td>X-Ray Diffractometer</td>
<td>P-Analyticals, Philips, Mpd</td>
</tr>
<tr>
<td>5.</td>
<td>FTIR Spectrophotometer</td>
<td>JASCO FT-IR 410</td>
</tr>
<tr>
<td>6.</td>
<td>Digital balance</td>
<td>SHIMDZU – BL – 220 H</td>
</tr>
<tr>
<td>7.</td>
<td>SEM Instruments</td>
<td>Hitachi Model S-450</td>
</tr>
<tr>
<td>10.</td>
<td>Oven</td>
<td>Genuine Manufactures.</td>
</tr>
<tr>
<td>11.</td>
<td>Stability chamber</td>
<td>Skylab, Mumbai</td>
</tr>
</tbody>
</table>