ABSTRACT
Orodispersible dosage forms are used for accurate dosing, enhanced bioavailability, rapid action, patient compliance, easy of administration, enhanced palatability. The aim of the experiment is to formulate metoprolol tartrate oral disintegrating tablets using different superdisintegrants like (Sodium starch glycolate (SSG), Croscarmellose sodium (CCS), Crospovidone (CP), Low-substituted hydroxypropyl cellulose (L-HPC). 12 formulations of tablets were prepared using direct compression method and the formulated tablets were subjected to different physicochemical evaluation tests like hardness, weight variation, disintegration, thickness, drug content uniformity, water absorption ration, wetting time and In vitro dissolution. From the results of drug release and disintegration time formulation F9 containing, crospovidine 5% as superdisintegrant was selected as the optimized formula for the formulation of disintegration tablets of metoprolol tartrate.

KEYWORDS: Sodium starch glycolate (SSG), Croscarmellose sodium (CCS), Crospovidone (CP), Low-substituted hydroxypropyl cellulose (L-HPC).

OBJECTIVE
• To prepare and evaluate different formulations(12) of Metoprolol Tartrate oral disintegrating tablets by using different super-disintegrants (Sodium starch glycolate (SSG), Croscarmellose sodium (CCS), Crospovidone (CP), Low-substituted hydroxypropyl cellulose (L-HPC).

• From these formulations optimized formulation is selected based on release characteristics and it is compared with normal conventional tablet.
Rationale of work

• To disintegrate tablets in mouth with in 1 minute.
• To improve patient compliance

Plan of work

• To identify the physicalchemical interaction between drug and carrier by Fourier Transform Infrared Spectroscopy (FTIR)
• Evaluation tests for the Precompression blend.
• To formulate Metoprolol tartarate oral disintegrating tablets.
• Preparation of orally disintegrating tablets by direct compression method using different superdisintegrants like sodium starch glycolate, croscarmellose sodium, crospovidone, L-HPC at different concentrations.
• Evaluation of prepared oral disintegrating tablets.
• Selection of the best formulation of tablets based on the *invitro disintegration time and invitro dissolution studies* and comparing with marketed product.

METHODS

**Construction of standard graph of Metoprolol tartarate**

100 mg of metoprolol tartarate was accurately weighed and dissolved in 100 ml pH 6.8 phosphate buffer in a 100 ml volumetric flask (1000 µg/ml).

10 ml of this solution was taken and made up to 100 ml with pH 6.8 phosphate buffer which gives 100 µg/ml concentration (stock solution). 10 ml of above stock solution was taken and made up to 100 ml with pH 6.8 phosphate buffer which gives 10 µg/ml concentration (stock solution).

From this stock solutions concentrations of 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 and 26 µg/ml in pH 6.8 phosphate buffer were prepared. The absorbance of the diluted solutions was measured at 275 nm and a standard plot was drawn using the data obtained.

**Preparation of Metoprolol tartarate tablets**

**The quantitative composition of ODT formulation.**

<table>
<thead>
<tr>
<th>Ingredients (mg)</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
<th>F7</th>
<th>F8</th>
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<td>7.5</td>
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</table>
The quantitative composition of ODT formulation.

<table>
<thead>
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<th>Ingredients(mg)</th>
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<th>F10</th>
<th>F11</th>
<th>F12</th>
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<tr>
<td>Sodium starch glycolate</td>
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<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Croscarmellose Sodium</td>
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<tr>
<td>Crospovidone(CP)</td>
<td>7.5</td>
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<tr>
<td>L-HPC</td>
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<td>MCC-102</td>
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<td>Total weight</td>
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Evaluation of Precompression Blend
Physical Evaluation of Tablets
Dissolution Studies

RESULTS AND DISCUSSION

Standard graph of Metoprolol tartarate in 6.8 pH buffer
FTIR of Metoprolol tartarate drug and optimized formulation

<table>
<thead>
<tr>
<th>SI No.</th>
<th>IR spectrum</th>
<th>Peak area (cm$^{-1}$)</th>
<th>Functional groups</th>
<th>Stretching / Deformation</th>
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</thead>
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<tr>
<td>1</td>
<td>Metoprolol Tartarate</td>
<td>1374.04, 1698.22, 1542.16</td>
<td>N-H (3° Amine), COOH, C-O</td>
<td>N-H (3° Amine), Stretching Vibration, Stretch</td>
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<tr>
<td>2</td>
<td>F9 (Drug + crospovidone + Other excipients)</td>
<td>1374.41, 1698.48, 1541.62</td>
<td>N-H (3° Amine), COOH, C-O</td>
<td>N-H (3° Amine), Stretching Vibration, Stretch</td>
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</tbody>
</table>

Evaluation of Pre-compression Blend

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Angle of Repose ± SD</th>
<th>Bulk Density ± SD</th>
<th>Tapped Density ± SD</th>
<th>Compressibility Index ± SD</th>
<th>Hausner’s Ratio ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>25.8±0.04</td>
<td>0.52±0.01</td>
<td>0.62±0.04</td>
<td>16±0.35</td>
<td>1.19±0.09</td>
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<tr>
<td>F2</td>
<td>24.9±0.05</td>
<td>0.53±0.23</td>
<td>0.61±0.08</td>
<td>13±0.11</td>
<td>1.15±0.03</td>
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<tr>
<td>F3</td>
<td>24±0.09</td>
<td>0.53±0.02</td>
<td>0.64±0.09</td>
<td>17±0.11</td>
<td>1.20±0.06</td>
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<td>F4</td>
<td>23.8±0.14</td>
<td>0.50±0.13</td>
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<td>20±0.51</td>
<td>1.26±0.03</td>
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<td>F5</td>
<td>24.2±0.08</td>
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<td>0.65±0.07</td>
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<td>1.20±0.07</td>
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<tr>
<td>F6</td>
<td>24.4±0.07</td>
<td>0.52±0.13</td>
<td>0.63±0.08</td>
<td>17±0.33</td>
<td>1.21±0.4</td>
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<td>0.62±0.08</td>
<td>17±0.52</td>
<td>1.21±0.08</td>
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<td>F8</td>
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<tr>
<td>F9</td>
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<td>18±0.11</td>
<td>1.25±0.03</td>
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<td>F10</td>
<td>23.7±0.03</td>
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<td>1.21±0.05</td>
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<td>F11</td>
<td>25.5±0.02</td>
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<td>0.65±0.8</td>
<td>15±0.19</td>
<td>1.14±0.03</td>
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<tr>
<td>F12</td>
<td>24.8±0.04</td>
<td>0.52±0.32</td>
<td>0.62±0.05</td>
<td>16.6±0.10</td>
<td>1.19±0.02</td>
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</table>
Evaluation of Prepared Metoprolol tartarate Oral Disintegrating Tablets

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Hardness (Kg/cm²) ± SD</th>
<th>Thickness (mm) ± SD</th>
<th>Friability</th>
<th>Weight Variation ± SD</th>
<th>Drug Content ± SD</th>
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<tbody>
<tr>
<td>F1</td>
<td>2.2±0.1</td>
<td>3.1±0.01</td>
<td>0.63</td>
<td>151.6±0.5</td>
<td>95.6±1.25</td>
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<tr>
<td>F2</td>
<td>2.2±0.1</td>
<td>3.2±0.08</td>
<td>0.69</td>
<td>149.6±0.08</td>
<td>102.2±2.99</td>
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<tr>
<td>F3</td>
<td>2.3±0.1</td>
<td>3.2±0.02</td>
<td>0.72</td>
<td>152.3±0.5</td>
<td>96.3±1.33</td>
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<tr>
<td>F4</td>
<td>2.3±0.1</td>
<td>3.0±0.03</td>
<td>0.81</td>
<td>152±0.5</td>
<td>99.8±1.40</td>
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<td>0.87</td>
<td>149±1.0</td>
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<td>100.6±2.56</td>
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<td>99.9±1.21</td>
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<td>0.81</td>
<td>150±0.7</td>
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Evaluation of Prepared Metoprolol tartarate Oral Disintegrating Tablets

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Wetting Time (sec) ± SD</th>
<th>Water Absorption Ratio (WAR) ± SD</th>
<th>In vitro Disintegration Time (sec) ± SD</th>
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<tbody>
<tr>
<td>F1</td>
<td>43.63±0.058</td>
<td>70±2.7</td>
<td>29.71±1.5</td>
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<tr>
<td>F2</td>
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<td>F3</td>
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<td>36.66±0.02</td>
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<td>F7</td>
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<td>F9</td>
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<td>115±0.01</td>
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<tr>
<td>F10</td>
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<td>27.48±0.6</td>
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<tr>
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<td>F12</td>
<td>40.33±0.50</td>
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In vitro Drug Release Studies of Prepared Tablets at Different Concentrations of SSG and CCS

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<th>F4</th>
<th>F5</th>
<th>F6</th>
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<td>0</td>
<td>0</td>
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<tr>
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<td>38.56±1.1</td>
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<td>49.08±2.58</td>
<td>32.97±2.15</td>
<td>26.54±1.72</td>
<td>46.46±2.58</td>
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<tr>
<td>4</td>
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<td>64.8±0.69</td>
<td>53.07±0.86</td>
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<td>6</td>
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<td>91.03±0.86</td>
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In vitro Drug Release Studies of Prepared Tablets at Different Concentrations of CP and L-HPC

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<th>F9</th>
<th>F10</th>
<th>F11</th>
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<tr>
<td>2</td>
<td>23.8±2.15</td>
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<td>52.46±2.58</td>
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<td>29±2.58</td>
<td>10.5±1.2</td>
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<tr>
<td>4</td>
<td>56.2±1.72</td>
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<td>65.59±0.86</td>
<td>50.7±1.72</td>
<td>58±1.72</td>
<td>53.07±0.86</td>
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<tr>
<td>6</td>
<td>73.79±2.58</td>
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<td>85.8±1.29</td>
<td>63±2.58</td>
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<td>15</td>
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</table>

Comparison of optimised formula and conventional tablet

![Graph showing drug release over time for optimised formula and conventional tablet.]
CONCLUSION

• IR-spectroscopic studies indicate that there are no drug exipients interactions.
• Tablets prepared by direct compression method were without any chipping, capping and sticking.
• The percentage friability was less than 1% in all the cases.
• Weight variation was less than ±7.5%, the results suggesting the tablets prepared were uniform in weight
• In vitro Disintegration time was in the range of 20±0.7 sec to 32.98±0.6 sec
• Increased concentration of super disintegrants increases water absorption ratio and decreases wetting time.
• In vitro drug release studies showed that, the best formulation (F9) containing Crospovidone 5% released 99.7±2.5% of drug within 15 min, which is more when compared with normal conventional Metoprolol Tartrate(25mg), the drug release in 15min is only 62.2%.
• Finally optimized formulation(F9) was better than conventional formulation, so it is suggested that it is better to go Metoprolol Tartrate drug as oral disintegrating tablet than normal conventional tablet i.e because of better release, with less disintegration time and convenience of usage.

REFERENCES

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