Development and validation of spectrophotometric method for the estimation of loxapine in bulk and tablet dosage forms

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Abstract: A selective, rapid and economic UV spectrophotometric method for the estimation of loxapine has been developed and validated. The process of development and validation performed on a Shimadzu UV-1800 UV-visible spectrometer and detection wavelength was 297nm. The calibration graph of loxapine was linear at the concentrations of 5-100 µg/mL. The accuracy was determined by proposed method and the recovery was found to be in the range of 98% to 101%.

Keywords: Loxapine, UV, Linearity, Accuracy.

INTRODUCTION
Loxapine (Fig.1) is a dibenzoaxepine compound. It is a subclass of tricyclic antipsychotic agents. Loxapine is used to control the signs of psychotic disorders like schizophrenia. Loxapine shows two major actions namely, dopamine antagonist and serotonin 5-HT2 blocker, chemically it is 8-chloro-6-(4-methylpiperazin-1-yl)benzo[b][1,4]benzoxazepine. The chemical formula of loxapine is C18H18ClN1. Loxapine shows its important potency at the 5HT2A receptor.

The main purpose of this study was to develop simple and cost effective analytical method by UV spectroscopy for the estimation of loxapine in bulk and capsule dosage form.

EXPERIMENTAL
Materials
Loxapine API was produced from KP labs, Hyderabad. The capsule formulation of Loxapine was purchased from the local market (LOXAPAC 10-Label claim 10mg).

Instrumentation and Apparatus
The complete process was carried out on a Shimadzu UV-1800 UV-Visible spectrometer. All materials involved in the analysis were weighed on Shimadzu Digital electronic balance model Shimadzu-BL 200H. Ultra sonicator of model 2k811056 was used to dissolve the drug completely without leaving any particles. The process was performed at room temperature.

Preparation of Standard solution
Loxapine working standard of 10 mg was dissolved in 100 mL of distilled water to get the stock solution of concentration 100 µg/mL. The working standard solution of Loxapine were prepared by appropriate dilution of the stock solution using water.

**Selection of Detection wavelength**

The working standard solution of Loxapine was scanned in UV range. The detection wavelength selected was 297nm from the spectra as the drug shows the considerable absorption.

**Preparation of Calibration graph**

By using linearity concentrations, calibration graph was plotted. Linearity was performed for Loxapine. Absorbance was measured for different concentrations (5-100µg/ml) of Loxapine working standard solutions. The correlation coefficient of Loxapine was found to be 0.997. The regression equations were $y=0.0162x+0.0115$.

**Range**

From linearity studies, Range was calculated. Range was found to be 5-100 µg/mL for Loxapine.

**Precision**

The study of intra-day precision was done by measuring the absorbance of working standard solution on same day. The precision was measured in terms of %RSD. The results are shown in Table-1.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Absorbance</th>
<th>%RSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.161</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.158</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.166</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.165</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.166</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.163</td>
<td>1.88</td>
</tr>
</tbody>
</table>

Table-1: Intra-day Precision data

Inter-day precision studies were also carried out by measuring the absorbance of working standard solution in six different days. The results were calculated in terms of %RSD. The results are shown in Table-2.
## Accuracy

The %Recovery was calculated at three different concentrations equivalent to 80%, 100% and 120% of the target concentration of active ingredient, by the addition of standard to a sample of known concentration of Loxapine. The results were shown in Table-3.

### Table-3: Accuracy results of Loxapine

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Level</th>
<th>Amount of marketed formulation (µg/mL)</th>
<th>Amount of API mixture added (µg/mL)</th>
<th>Total amount of both the drugs (µg/mL)</th>
<th>Absorbance</th>
<th>Total amount of drug found (µg/mL)</th>
<th>% Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80%</td>
<td>10</td>
<td>8</td>
<td>18</td>
<td>0.282</td>
<td>18.12</td>
<td>100.67</td>
</tr>
<tr>
<td>2</td>
<td>100%</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>0.308</td>
<td>19.72</td>
<td>98.61</td>
</tr>
<tr>
<td>3</td>
<td>120%</td>
<td>10</td>
<td>12</td>
<td>22</td>
<td>0.348</td>
<td>22.20</td>
<td>100.87</td>
</tr>
</tbody>
</table>

### Limit of Detection and Limit of Quantification:

The detection limit (LOD) and quantification limit (LOQ) may be expressed as:

\[
\text{L.O.D.} = 3.3 \left( \frac{\text{S.D}}{\text{slope}} \right)
\]

\[
\text{L.O.Q.} = 10 \left( \frac{\text{S.D}}{\text{slope}} \right)
\]

Where, SD = Standard deviation of the response

The LOD was found to be 1.85 µg/ml and LOQ was found to be 5.56 µg/ml.

### Sample analysis

Twenty Loxapac-10 tablets each containing 10 mg of Loxapine were weighed, average weight was calculated and powdered. A quantity equivalent to 100 mg of Loxapine was weighed and transferred into 100 ml volumetric flask. It was dissolved in distilled water. The volumetric flask was sonicated for about 5mins to affect the complete dissolution of the drug and the solution was made up to the volume with distilled water to obtain concentration of 1000µg/ml and filtered. This solution was further diluted with distilled water to get a solution having concentration of 10µg/ml of Loxapine. The absorbance was measured at 297nm.

### CONCLUSION

The UV spectrophotometric method was developed for the estimation of Loxapine in bulk and capsule dosage forms. In this method water was used as the solvent which is economic and simple. The method was validated as per ICH guidelines and applied successfully for estimation of loxapine in marketed formulation.

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### REFERENCES