UV SPECTROPHOTOMETRIC VALIDATION FOR IDENTIFICATION AND DETERMINATION OF LOSARTAN POTASSIUM IN TABLETS

J.Subbarao*, Dr.P.Venkateswara Rao, Dr.S.Vidyadhara, B.Venkateswara Rao and R.L.C.Sasidhar
Chebrolu hanumaiah institute of pharmaceutical Sciences, Chandramoulipuram, Chowdavaram,
Guntur-522019, Andhra Pradesh, India.
Email: subba_pharmaco@yahoo.co.in

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Abstract:
The current study is to validate spectrophotometric method with UV detection for identification and determination of losartan potassium in respect of analytical parameters accuracy, precision, linearity. This simple, sensitive, accurate, economical and reproducible UV Spectrophotometric method can be applied for the determination of Losartan Potassium (LP) tablet dosage forms. The method is based on an observation that the aqueous solution of losartan potassium exhibits an absorbance maximum at 205nm and obeys Beer’s law in the concentration range 1-5µg / ml. The statistical analysis data indicated a high level of precision for the proposed method. The coefficient of correlation was highly significant (0.995). The analytical results and recovery studies were validated statistically and found to be satisfactory. The proposed method has been applied successfully in the analysis of losartan potassium tablet formulation with good accuracy and precision. This method can be applied for the quality control of losartan potassium in tablets.

Introduction:
Losartan Potassium is non-peptide drug with gradual and long lasting antihypertensive effect, highly specific angiotensin II receptor (type AT1) antagonist, which is widely used for the treatment of moderate to severe essential hypertension alone and in combination with diuretics and/or calcium antagonist. Losartan Potassium also provides renal protection for type II diabetic patients with proteinuria and stroke prevention. Chemically losartan potassium is monopotassium salt of 4-butyl-4-chloro-1-[(2’-(1H-tetrazol-5-yl) [1, 1’-biphenyl]-4-yl] methyl]-1H-imidazole-5-
methanol\textsuperscript{1-4}. It is official in I.P. & U.S.P. which describes liquid chromatography for assay. Literature survey reveals that several methods such as thin layer chromatography\textsuperscript{5}, HPLC\textsuperscript{6} and derivative spectrophotometry\textsuperscript{7-9} for the determination of losartan potassium in biological fluids and in dosage forms.

The present work aims to validate spectrophotometric method with UV detection for identification and determination of losartan potassium in respect of analytical parameters accuracy, precision, linearity.

**Materials & methods:**

**Instrumentation:**
Absorbance measurements were made with ELICO digital double beam UV- VIS spectrophotometer Model SL- 218. 1cm matched quartz cells were used for spectral measurements. LC-GC made analytical balance of 0.0001g sensitivity was used for weighing purpose.

**Reagents:**
Double distilled water was used for analytical purpose. Losartan potassium pure drug was obtained as a gift sample from Dr. Reddy’s laboratories, Hyderabad. The tablet formulations of different brands were procured from local market.

**Procedure:**

**Standard Stock Solution:** 10 mg of accurately weighed Losartan potassium was dissolved of distilled water to 100ml (100µg/ml primary stock solution) and 1 ml was diluted to 10ml with the same solvent to obtain a sample of concentration \(10^{-5}\) g/ml. The absorbance of the final solution was measured at \(\lambda = 205\text{nm}\), using distilled water as blank solution.

**Procedure for calibration curve:** In to a series of 10ml volumetric flasks, appropriate aliquots of primary standard solution were pipetted out separately and diluted with distilled water to obtain a series of concentrations ranging from 1-5µg/ml. The absorbance was measured at \(\lambda = 205\text{nm}\) using distilled water as blank. Calibration curve was plotted for concentration of Losartan potassium vs. measured absorbance.

**Assay:** The commercial tablet formulations of losartan potassium of two different brands with two different strengths(25mg,50mg) and brands namely COSART manufactured by Cipla Laboratories and RESILO manufactured
by Dr.Reddy’s laboratories, Hyderabad, containing 25mg & 50mg of losartan potassium respectively were procured from local pharmacy and were analyzed by proposed method.

**Preparation of Sample Solution:** 20 Tablets of Losartan Potassium of two different strengths (25mg & 50mg usual strength) were accurately weighed and crushed in to fine Powder separately. A quantity equivalent to 20 mg of each strength of Losartan Potassium was dissolved in 100 ml of distilled water, shaken for 15 min. The solution was filtered through Whatman filter paper No. 40 in to 10 ml Volumetric Flask. The resulting solution was diluted to obtain appropriate concentration in the calibration range. The absorbance was measured at $\lambda = 205$ nm and the amount of drug was determined by interpolation on the calibration graph.

**Validation of analytical method:**

The method was validated according to ICH Q2B Guideline “Validation of Analytical Procedures Methodology” in order to determine linearity, sensitivity, precision and accuracy.

1) **Linearity:**

An accurately weighed quantity of Losartan potassium 1mg, 1.5mg, 2mg, 2.5mg, 3mg, 3.5mg, 4mg, 4.5mg and 5mg was dissolved in distilled water to 100ml. 1ml aliquots of the resulting solution were diluted to 10 ml to produce series of solutions of concentrations of 1 µg/ml, 1.5µg/ml, 2 µg/ml, 2.5µg/ml, 3µg/ml, 3.5µg/ml, 4µg/ml, 4.5 µg/ml and 5µg/ml, which were analyzed by measuring the absorbance at $\lambda = 205$nm. The Beer-Lambert’s concentration range was found to be 1-5µg/ml.

The prepared solutions with increasing concentrations of losartan potassium reference standard were analyzed by UV- spectrophotometric method. For every concentration in µg/ml was measured the response value of the absorption in absorbance units at $\lambda = 205$nm. The experimental results were putted in to linear regression analysis. The regression calibration curve is built. The obtained regression equation is $y = 0.1372x - 0.0457$, shows the proportional accordance $A=f(c)$ in linear concentration range of 1-5µg/ml, where the Buge-Lambert-beers law is valid. Coefficient of regression (R) is calculated: $R^2 = 0.995$. The calibration curve for $A > 0.1$ at $\lambda = 205$nm is illustrated on Fig.1.
2) Accuracy:

An accurately weighed quantity of standard losartan potassium equivalent to 40mg (80%), 50mg (100%) and 60mg(120%), of theoretical concentration of losartan potassium in tablets (50mg) was added to a known amount of tablet excipients to obtain three different mixtures. From every mixture were prepared three solutions as follows: an accurately weighed quantity containing reference standard losartan potassium (40mg, 50mg, 60mg) and the tablet excipients were dissolved in distilled water to 100ml and aliquot part of 1ml is diluted to 10 ml. the absorbance of the last samples are measured at $\lambda = 205$nm.

Analytical parameters accuracy is presented by the degree of recovery $R$ (%) ± RSD (%). For all solution of recovery studies relative errors are lower than 2.0. the recovery data is provided in Table: 1

Table: 1 - Recovery data.

<table>
<thead>
<tr>
<th>Added content of losartan potassium reference standard</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>L(40 mg)</td>
<td>L(50 mg)</td>
<td>L(60 mg)</td>
</tr>
<tr>
<td>1</td>
<td>39.8</td>
<td>49.6</td>
<td>59.8</td>
</tr>
<tr>
<td>2</td>
<td>40.1</td>
<td>50.3</td>
<td>60.1</td>
</tr>
<tr>
<td>3</td>
<td>40.4</td>
<td>50.4</td>
<td>60.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Obtained quantity of losartan potassium after recovery</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>CL(40mg)</td>
<td>CL(50mg)</td>
<td>CL(60 mg)</td>
</tr>
<tr>
<td>1</td>
<td>40.24</td>
<td>50.29</td>
<td>60.13</td>
</tr>
<tr>
<td>2</td>
<td>39.88</td>
<td>49.75</td>
<td>59.9</td>
</tr>
<tr>
<td>3</td>
<td>40.69</td>
<td>49.7</td>
<td>59.87</td>
</tr>
</tbody>
</table>

$\bar{x}$  
SD  
% RSD  
%Recovery±%RSD

- $\bar{x}$  
- SD  
- % RSD  
- %Recovery±%RSD

100.45±0.896  99.6±1.5  99.80±0.687
3) Precision:

Precision of the method was assessed by study of repeatability and intermediate precision. Precision is used to assess the uncertainty of the result, which is determined by % RSD. Intermediate precision (Interday) was also determined at the same concentration on successive days. At confidence possibility of $P = 95\%$ all data for the obtained quantity of losartan potassium correspond to the relevant confidence interval. All values of relative standard deviation are lower than 2.0. The results were tabulated in Table 2.

Table-2: Optical characteristics and precision

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda_{max}(\text{nm})$</td>
<td>205</td>
</tr>
<tr>
<td>Beer’s law limit (µg/ml)</td>
<td>1-5µg/ml.</td>
</tr>
<tr>
<td>Molar absorptivity ($\text{lt. mol}^{-1}\text{ cm}^{-1}$)</td>
<td>$4.117 \times 10^4$</td>
</tr>
<tr>
<td>Sandell’s sensitivity ($\mu\text{g/cm}^2/0.001 \text{ abs units}$)</td>
<td>0.00909</td>
</tr>
<tr>
<td>Regression equation*</td>
<td>$y = 0.1372x - 0.0457$</td>
</tr>
<tr>
<td>Slope (b)</td>
<td>0.1372</td>
</tr>
<tr>
<td>Intercept (a)</td>
<td>0.0457</td>
</tr>
<tr>
<td>Correlation co-efficient ($r^2$)</td>
<td>0.995</td>
</tr>
<tr>
<td>% range of error</td>
<td>0.853</td>
</tr>
<tr>
<td>(0.05 level)**</td>
<td></td>
</tr>
<tr>
<td>PRECISION</td>
<td></td>
</tr>
<tr>
<td>Interday (intermediate precision)</td>
<td>0.73</td>
</tr>
<tr>
<td>Intraday (repeatability)</td>
<td>0.62</td>
</tr>
</tbody>
</table>

* $y= a+ bx$, where $x$ is the concentration of Losartan Potassium in µg/ml and $y$ is the absorbance at corresponding concentration.

** Average of 6 determinations

Results & discussion:

The optical characteristics such as Beer’s law limits, sandell’s sensitivity, molar extinction coefficient, percent relative standard deviation and percent range of errors were calculated. The results were summarized in Table 1. The method is validated for precision which includes repeatability (%RSD 0.62) and intermediate precision (% RSD 0.73). The method is ascertained to be having good reproducibility and repeatability. The accuracy of the developed method is
demonstrated. The values obtained for the determination of losartan potassium in tablets by the proposed method are presented in Table 2. Studies reveal that the common excipients and other additives usually present in the tablets did not interfere in the proposed method.

**Conclusion:**

The low value of relative standard deviation for repeated measurements indicates that the method is precise. The value of SD in recovery study is less than two, which indicates the methods can be used for estimation of losartan potassium without any interference due to the other components present in the tablet formulation. Hence the proposed method is simple, accurate, precise and cost effective.

**Acknowledgements:**

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**References:**


**Corresponding Author:**

**J.Subbarao**,  
**Email:** subba_pharmaco@yahoo.co.in