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# UV-Spectrophotometric methods for estimation of Valsartan in bulk and tablet dosage form

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**ABSTRACT:** Two simple, precise and accurate UV spectrophotometric methods has been developed and validated for the estimation of valsartan (VAL) in bulk and tablet dosage form. The zero order spectra of valsartan in methanol shows λmax at 250.0 nm and estimation was carried out by A(1% 1cm) and by comparison with standard (Method I). The second order spectra showed λmax at 241.0 nm where n=2 and estimation were carried out by comparison with standard (Method II). Calibration graphs were found to be linear ($r^2$=0.999) over the concentration range of 10-50µg/mL. The proposed methods were validated for its accuracy, precision, specificity, ruggedness and robustness. Both the methods can be adopted in its routine analysis.

**Key words**: Valsartan, methanol, Uv-spectrophotometric, Zero order and second order spectra

## INTRODUCTION

Valsartan chemically is N-[p-(o-1H-Tetrazol-5-yl-phenyl) benzyl]-N-valeryl-L-valine[1](Figure 1).It is an angiotensin II receptor antagonist, effective in the treatment of hypertension[2]. It is also effective when used alone or in combination with other drugs for the treatment of high blood pressure[3]. It is not official in any of the pharmacopoeia. The pharmacokinetic properties of valsartan have been investigated in healthy volunteers after oral administration of the sample[4]. High performance liquid chromatographic (HPLC) determination of valsartan in biological fluids was studied [5–7] and also a chiral HPLC method was developed[8]. Valsartan and hydrochlorothiazide were determined in tablets simultaneously by HPLC[9,10] and Spectrofluorimetric method was developed for determination of losartan and valsartan in human urine[11]. No validated UV and derivative-spectrophotometric studies on valsartan, individually in pharmaceutical preparations have been found in the literature.

## EXPERIMENTAL

### Materials and Methods

The spectrophotometric measurements were carried out using a Shimadzu UV-1700 Uv/Vis spectrophotometer with 1 cm matched quartz cell.

### Reagents

Valsartan was obtained as gift sample from alembic pharmaceuticals, Vadodara. Methanol AR grade was used as solvent throughout the experimentation. A pharmaceutical preparation was purchased from local pharmacy.

### Standard solutions

Stock solution of VAL (500µg/mL) was prepared in methanol. The standard solution of Valsartan having concentration of 10 µg/mL was scanned in the UV range (400-200 nm) in 1.0 cm cell against solvent blank and zero order and second order spectra's were recorded.

### Construction of Calibration curve

Working solution (30µg/mL) was prepared by appropriate dilution of the stock solution in methanol. Aliquots of stock solution of VAL were transferred into a series of 25 mL volumetric flask upto mark with methanol to get the concentration in the range 10-50 µg/mL. The absorbances of all the resulting solutions were measured at 250 nm against solvent blank. Similarly solutions were also read for their second order derivative absorbance at 241 nm. The calibration curve was plotted as concentration versus absorbance

over the range of 10-50 µg/mL with correlation coefficient of 0.9998 and 0.9987 for the proposed methods. The optical characteristics are recorded in **Table 1**

**Determination of absorptivity value, A (1%, 1cm)**
The standard solutions of Valsartan having concentration of 10 µg/mL, the absorbance of each of the solution was measured in triplicate in 1.0 cm cell against solvent blank at 250.0 nm and A (1% 1cm) values were calculated using formula as given below. The A (1%, 1cm) values are found to be 316.43

**Sample solutions**
Twenty tablets were weighed; average weight was determined and finely powdered. An accurately weighed quantity of tablet powder equivalent to 30 mg of VAL was transferred to 50 mL volumetric flask and dissolved by sonication with sufficient quantity of methanol, volume was made upto mark. The solution was then filtered through whatman filter paper no.41. A 5 mL portion of the filtrate was further diluted with methanol in a 100 ml volumetric flask upto mark (30µg/mL) on label claim basis. The absorbance of the resulting solution was measured at 250 nm (method I) and 241 nm (method II) against solvent blank. The results of estimation by proposed methods are shown in **Table 2**.

**VALIDATION**

**Accuracy**
Accuracy of the proposed methods was ascertained on the basis of recovery studies performed by standard addition method. Recovery studies were performed by adding standard drug at different levels to the pre-analysed tablet powder and the proposed method were followed. From the amount of drug estimated, percentage recovery was calculated. The results of the analysis are shown in **Table 2**.

**Precision**
It was ascertained by replicate analysis of the homogenous sample of tablet powder and CV of the estimations is shown in **Table 1** for two different brands of the sample by proposed methods.

**Interday and Intraday precision**
An accurately weighed quantity of tablet powder equivalent to about 30 mg Valsartan was transferred to 50.0 mL volumetric flask, shaken for 15 min, with methanol and diluted up to the mark with methanol to get stock solution of 500µg/mL. The contents were filtered through Whatmann filter paper (no. 41). Aliquot portions were further diluted with methanol to get concentration of 30 µg/mL of Valsartan (on labeled claim basis). The absorbance of the final solution was read after 0 hr, 3 hr, and 6 hr in 1.0 cm cell at selected wavelength **Table 4**. Similarly the absorbance of the same solution was read on $1^{st}$, $3^{rd}$ and $5^{th}$ day. The amount of Valsartan was estimated by comparison with the standard and by taking A (1%, 1cm) at 250.0 nm (method I) and by derivative spectroscopy at 241.0 nm (method II). The results are recorded in **Table 4**

**Linearity and range**
An accurately weighed quantity of tablet powder equivalent to 80-120% of label claim of VAL was transferred and procedure as described under sample solution was followed, graph was plotted as percentage label claim vs. absorbance and was fond to be linear with correlation coefficient value of 0.9999.

**Stability**
An accurately weighed quantities of tablet powder equivalent to 30 mg of VAL were transferred to series of 50 mL volumetric flask and kept under following conditions viz: Alkaline (0.1N NaOH), Acidic (0.1N HCl) reflux for 3h, 3%$H_2O_2$ at 50°C, Heat (60°C), humidity (75%RH) for 24h and after the specified time volume was made upto the mark with methanol, filtered and procedure as described under sample solution was followed. Results of stability studies are recorded in **Table 3**.

**Ruggedness**
It was carried out by analyzing the sample by three different analyst and estimation of drug by proposed methods. Results of studies are shown in **Table 4**.

**Table 1 Optical Characteristics**

| Parameters | Percent Label Claim | |
|---|---|---|
| | Method I | Method II |
| Absorption maxima | 250.0 nm | 241.0 nm |
| Linearity | 10-50 µg/mL | 10-50 µg/mL |
| A(1%, 1cm) | 316.42 | ------- |
| Correlation coefficient | 0.9998 | 0.9987 |

**Table 2 Summary of results of estimation and recovery studies**

| Sample | Percent Label Claim estimated* | | | Percent Recovery** | | |
|---|---|---|---|---|---|---|
| | Method I | | Method II | Method I | | Method II |
| | Comparison with Standard | A1%, 1cm | Derivative | Comparison with Standard | A1%, 1cm | Derivative |
| Brand-1 | 100.24 ±0.20 | 99.63 ± 0.19 | 99.25 ± 0.41 | 99.08 ±0.20 | 99.59 ±0.20 | 100.18 ±0.20 |
| Brand-2 | 99.36 ±0.28 | 99.97± 0.15 | 100.22 ±0.24 | 99.81 ±1.00 | 99.76 ±1.19 | 100.31 ±1.39 |

*Mean of five determinations± standard deviation, ** Mean of four determinations± standard deviation

**Table 3 Results of stability studies**

| Sample (treated) | Percent Label Claim | | |
|---|---|---|---|
| | Method I | | Method II |
| | Comparison with standard | A 1% 1cm | Derivative |
| 0.1N NaOH, reflux 3h | 93.47 | 93.85 | 86.98 |
| 0.1N HCl, reflux 3h | 94.09 | 93.59 | 87.94 |
| 3% $H_2O_2$ at 50°C for 24h | 98.43 | 98.05 | 99.16 |
| 60°C for 24h | 97.38 | 97.29 | 97.18 |
| Humidity (75% RH) | 92.97 | 92.39 | 90.25 |

**Table 4: Summary of validation parameters**

| Parameters | Percent Label Claim | | |
|---|---|---|---|
| | Method I | | Method II |
| | Comparison with standard | A 1% 1cm | Derivative |
| **Intra Day Precision (n=3)** | | | |
| Amount found ± | 99.45 | 98.72 | 98.65 |
| RSD (%) | 0.98 | 1.20 | 2.19 |
| **Inter Day Precision (n=3)** | | | |
| Amount found ± | 96.68 | 97.35 | 92.48 |
| RSD (%) | 3.27 | 2.14 | 6.48 |
| **Ruggedness (%RSD)** | | | |
| Analyst to Analyst (n=3) | 0.17 | 0.18 | 0.15 |

## RESULTS AND DISCUSSION

The UV spectrum of standard solutions of VAL was studied in methanol. Sharp peaks were not observed in the first and third derivative spectra, good amplitude was also observed and the peak was well defined, hence second order derivative was selected for analysis. Zero order and second order spectrum are shown in Figure 1a and 1b respectively. The A1%, 1cm value at 250 nm was found to be 316.42.The results obtained by method I and II were compared by using student's t-test (paired, two sided) and F-test. The t- and F-test values by comparison with Standard Vs A1% 1cm (1.195, 3.467), A1% 1cm Vs Derivative (2.90, 4.086) and comparison of Standard Vs Derivative (0.939, 3.476) which are less than the corresponding statistical values, indicative no significant difference in means and variances of results obtained by either proposed methods which are within the statistical limits. The percent recovery was found to be nearly 100% indicating reproducibility and accuracy of the methods. Both the proposed methods were found to be simple, precise and economical and can be adopted for routine quality control of drug.

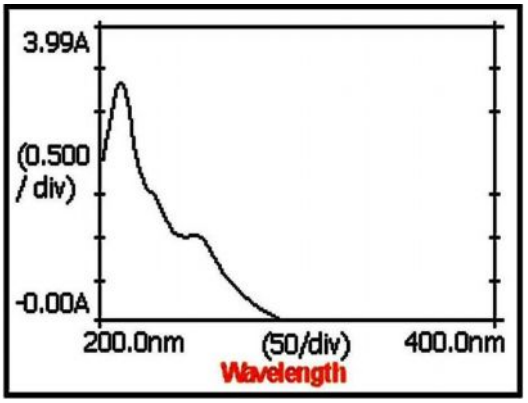


**Figure 1a: Zero order spectra of Valsartan**

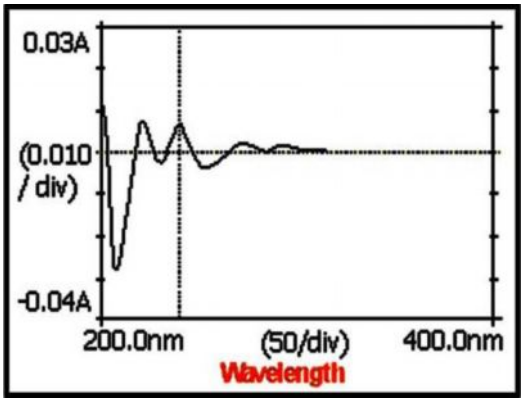


**Figure 1b: Second order spectra of Valsartan**

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