*Asian Journal of Chemistry* Vol. 21, No. 1 (2009), 206-210

# Spectrophotometric Determination of Valdecoxib from Bulk Drug and Formulation

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The present method was used for bulk form as well as the formulation of the valdecoxib and was expanded to study dissolution profile of valdecoxib tablets. The measurements were done at 241 nm, linear concentration range was observed to be 3-17 µg/mL. In the UV method, the percentage recovery was found to be between 99.52-100.32. The dissolution studies indicate that the method can be used for the development of formulations. The low values of the standard deviation and % coefficient of variation also confirms the accuracy and suitability of the method.

**Key Words: Spectrophotometry, Valdecoxib.**

## INTRODUCTION

Valdecoxib is a non-steroidal antiinflammatory drug exhibiting anti-inflammatory, analgesic and antipyretic properties. Valdecoxib is a selective inhibitor of cyclooxygenase-2 and mainly used for the treatment of osteo-arthritis, rheumatoid arthritis and primary dysmenorrhoea. Its chemical name is 4-(5-methyl-3-phenyl-4-isoxazolyl)benzene sulfonamide[1]. There are several methods reported in the literature for the determination of valdecoxib[2-5].

The present research work describes a UV-spectrophotometric method for the estimation of valdecoxib from bulk drug and its pharmaceutical formulation. The measurements were done at 241 nm, the wavelength of maximum absorbance. The method was extended to study dissolution pattern of valdecoxib from formulation (tablets).

Dissolution was carried out in 10 % (v/v) methanol in water because of water insolubility of the drug. The observations from application of method were subjected to statistical validation to determine its accuracy and precision. Other parameters like molar absorptivity, Sandell's sensitivity, extinction values were also determined.

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## EXPERIMENTAL

All the solvents used were of spectroscopic grade. Cecil 3000 series UV-visible scanning spectrophotometer equipped with 1 mL matched quartz cells and Electrolab dissolution test apparatus.

**Preparation of drug solution:** 25 mg pure standard of valdecoxib (99.92 %) was accurately weighed and transferred to 25 mL volumetric flask. The powder was dissolved in methanol and diluted up to the mark with methanol. This gave a standard stock solution of strength 1000 μg $mL^{-1}$; further this solution was serially diluted with methanol to give working standard solutions of 100 and 10 μg $mL^{-1}$.

**UV-Spectrophotometric method:** Using standard solution parameters like molar absorptivity, Sandell's sensitivity, extinction values of valdecoxib were determined and are given in Table-1. The experiment was performed as per the procedure given below:

TABLE-1
SPECTROPHOTOMETRIC PARAMETERS OF VALDECOXIB

| Parameters | Value |
|---|---|
| $E_{1}$ % in methanol | 549 |
| Molar absorptivity ($dm^3$ $mol^{-1}$ $cm^{-1}$) | $1.6535 \times 10^4$ |
| Sandell's Sensitivity (μg $cm^{-3}$ $cm^{-2}$) | $1.90 \times 10^{-2}$ |

**System suitability test:** The system suitability test was performed by taking absorbance of 10.0 μg $mL^{-1}$ valdecoxib six times. Mean, standard deviation and coefficient of variation were calculated. Results indicate conformity to all compendia requirements.

**Linearity experiment:** Into a series of standard volumetric flasks, varying volumes of standard solution equivalent to 3 to 17 μg $mL^{-1}$ were taken and diluted up to the mark with methanol. The measurement of each solution was carried out against methanol as blank at 241 nm. The calibration data in this range was further considered for statistical validation and regression analysis. The regression analysis of the calibration data was carried out to determine the relationship between the absorbance and concentration.

### Assay

**For bulk drug:** About 50 mg of valdecoxib bulk drug was accurately weighed and transferred into a 50 mL std volumetric flask, dissolved in methanol and diluted up to the mark with methanol. This was filtered through Whatmann filter paper No. 41. Further 2.5 mL filtrate was then transferred to a 25 mL volumetric flask and diluted up to the mark with methanol. 2.5 mL of this was again diluted in 25 mL volumetric flask to obtain 10.0 μg $mL^{-1}$ solution (assay level). Absorbance of this solution was measured at

241 nm. This procedure was repeated seven times individually weighing the bulk drug at each time. Using the calibration curve amount of valdecoxib present was calculated. The average of seven determinations was taken to determine the content of valdecoxib in the bulk drug.

**For pharmaceutical formulation:** 20 Tablets were accurately weighed and powdered finely in a mortar. Powder equivalent to one tablet was weighed accurately and transferred to 100 mL volumetric flask. The contents were dissolved and diluted up to the mark using methanol and filtered using Whatmann filter paper No. 41. Exactly 2.5 mL of filtrate was transferred in 25 mL flask and diluted up to the mark with methanol to give 10.0 µg $mL^{-1}$ solution. Absorbance was measured at 241 nm. Absorbance of standard 10.0 µg $mL^{-1}$ solutions was also taken. This procedure was repeated seven times individually weighing tablet powder each time. The amount of valdecoxib per tablet was calculated by comparing the absorbance values of standard and sample solutions.

**Recovery study:** To study the accuracy, reproducibility and to check whether any positive or negative interference occurs due to binders and excipients present in formulation recovery study was performed. The recovery studies were conducted by addition of different amount of pure drug with known concentration to a pre analyzed sample solution. The recovery of added samples was studied at four different levels 0.0, 5.0, 10.0 and 15.0 mg. Each level was repeated 7 times. From the results obtained amount of drug found, standard deviation, coefficient of variation and percentage recovery was calculated. Results obtained (Table-2) are within the acceptance limit indicating accuracy and precision of the method.

TABLE-2
RESULTS OF RECOVERY EXPERIMENT

| Set | Amount of valdecoxib standard added (mg) | Amount of valdecoxib standard found (mg) | Recovery (%) | SD | CV (%) |
|---|---|---|---|---|---|
| I | 5.02 | 5.04 | 100.32 | 0.036 | 0.735 |
| II | 10.03 | 9.98 | 99.52 | 0.048 | 0.479 |
| III | 15.03 | 14.99 | 99.77 | 0.063 | 0.423 |

**Dissolution study for valdecoxib tablets:** The testing of pharmaceutical dosage forms for *in vitro* drug release and dissolution pattern is important for ensuring batch to batch quality control and to optimize formulations during product development. Valdecoxib is a water insoluble drug and so poses a problem of bioavailability when administered orally. The dissolution rate can be the rate-limiting step in the *in vivo* absorption process. So there is definite need for the development of an appropriate dissolution test. Above

developed method was applied for studying dissolution profile *i.e.* % release of valdecoxib from its formulation (tablets).

**Method development:** Many media like 0.1 M HCl, 0.1 M NaOH, 0.1 M phosphate buffer, Tween-80 and different concentrations of SLS were tried but it was insoluble or incompletely soluble, so media containing organic solvent (methanol) in varying proportion *i.e.*, 1, 2, 5, 10 % (v/v) were tried. Drug was found soluble in 10 % methanol (v/v). So dissolution study was performed with this medium.

**Experimental:** Dissolution was carried in 900 mL 10 % methanol using type II (paddle type) apparatus. Dissolution was carried over a duration of 1 h. RPM of paddle was 100 and sampling time points were 5, 10, 20, 30, 45 and 60 min. At each time point 5 mL of sample was removed using glass pipette and was replaced with fresh medium.

Sample was filtered through Whatmann paper No. 41 and readings were taken at 241 nm wavelength against medium as blank. By using linearity data from above method the % of drug found was calculated. The experiment was carried out to compare drug release pattern of two different formulations manufactured by two different manufacturers. Experiment was carried using six tablets of each manufacturer. Comparative data is given in Table-3.

TABLE-3
COMPARATIVE DISSOLUTION PROFILE OF VALDECOXIB TABLETS

| Time (min) | Dissolution (%) | |
|---|---|---|
| | Standard | Test |
| 5 | 25.04 | 26.53 |
| 10 | 31.01 | 30.93 |
| 20 | 43.77 | 43.55 |
| 30 | 50.56 | 51.37 |
| 45 | 70.72 | 71.42 |
| 60 | 86.09 | 87.01 |

## RESULTS AND DISCUSSION

The proposed UV-spectrophotometric method is based on UV radiation absorbed by valdecoxib in methanol. The measurement was done at 241 nm. Beer's law is obeyed in the concentration range of 3-17 μg $mL^{-1}$. The percentage assay of both, bulk drug and pharmaceutical preparation obtained by this method is close to 100 %, indicating high accuracy of the method. The recovery experiment was carried out by the standard addition method. The recovery of the added standard was close to 100 %. This confirms the absence of either positive or negative interference in the formulation. A low value of standard deviation and % coefficient of variation indicates

preciseness of method. The methods developed are simple, fast, accurate and precise and hence can be used for routine quality control analysis of valdecoxib from bulk drug and its pharmaceutical preparation.

Dissolution study shows drug gets completely dissolved only in 10 % methanol. Comparable data of release pattern of two formulations indicates the method can be applied as quality control method to check batch-to-batch variation and also as a method for optimizing formulation during development.

## ACKNOWLEDGEMENTS

The authors are thankful to the Cadila Pharmaceuticals Limited for providing pure standard of valdecoxib. The are also due to Principal, College of Pharmacy, IPS Academy, Indore, for providing necessary facilities needed for the studies.

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(*Received*: 26 November 2007; *Accepted*: 20 August 2008) AJC-6757