UV SPECTROPHOTOMETRIC METHOD DEVELOPMENT AND VALIDATION OF IMATINIB IN BULK AND SOLID DOSAGE FORM

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ABSTRACT

Objective: A new, simple, sensitive, precise and reproducible UV spectroscopic method was developed for the estimation of Imatinib in bulk and solid dosage form. Methods: The UV spectrum of Imatinib showed λ max at 274nm. Beer’s law is valid in the concentration range of 4-20µg/ml. This method was validated for linearity, accuracy, precision, ruggedness and robustness. Results: The method has demonstrated excellent linearity over the range of 4-20µg/ml with regression equation y = 0.504x + 0.0014 and regression correlation coefficient r² = 0.9993. Moreover, the method was found to be highly sensitive with LOD (0.68μg/ml) and LOQ (2.06μg/ml). Conclusion: Depending on results the given method can be successfully applied for assay of Imatinib in Veenat capsule.

KEYWORDS

Imatinib, Methanol, UV spectroscopy, Method development and Validation and Imatinib Capsule.

INTRODUCTION

Imatinib is anticancer medicine. Malignancy is a group of sicknesses including irregular cell development with the possibility to attack or spread to different pieces of the body. Imatinib is a protein tyrosine kinase inhibitor that represses Bcr-Abl tyrosine kinase. Imatinib restrains proliferation actuates apoptosis in Bcr-Abl positive cell lines just as new leukemic cells from Philadelphia chromosome positive incessant myeloid leukemia. Unequivocally imatinib is used for unremitting myelogenous leukemia (CML) and extreme lymphocytic leukemia (ALL) that are Philadelphia chromosome-positive (Ph), specific sorts of
gastrointestinal stromal tumours (GIST), steady eosinophilic leukemia, constant eosinophilic leukemia (CEL), fundamental mastocytosis, and myelodysplastic disorder hypereosinophilic (HES). The Chemical name of Imatinib is \( \alpha-(4\text{-methyl-1-piperazinyl})-3'-(4-(3\text{-pyridyl})-2\text{-pyrimidinyl}) \) amino- p-toluidide. The sub-atomic recipe Imatinib C29H31N7O and sub-atomic weight is 589.71. Imatinib is white crystalline powder which in openly solvent in refined water, 0.1 N Hcl, methanol and sparingly dissolvable in dimethyl ether. The point of this examination is to give another, straightforward, touchy, exact and reproducible UV spectroscopic strategy was created for the estimation of Imatinib in definition.

RESULTS AND DISCUSSION
The absorption spectrum shows \( \lambda \) max of Imatinib at 274nm. The proposed method was validated according to ICH Q28 R1 guidelines for validation of analytical procedure.

Linearity
Five different concentrations of Imatinib were prepared and analysed at wavelength 274nm. The regression coefficient was found to be 0.9993. The absorbance was found in limit i.e. 0-2. Hence the analyzed parameter was found to be validated (Table No.1).

Accuracy
The concentration 4, 8, 12µg/ml was taken as 50, 100, 150% and % recovery was found to be in range 99%-101%. Hence the parameter was found to be validated.

Range
Range is an interval between highest and lowest concentration limit of the analyte i.e. 4-20µg/ml.

Precision
In precision intra-day and inter-day precision were performed at concentration 12(µg/ml). The obtained results were found within limit i.e. less than 2% RSD.

Limit of Detection (LOD)
The limit of detection was found to be 0.68µg/ml (Table No.6).

Limit of Quantification (LOQ)
The limit of quantification was found to be 2.06µg/ml (Table No.6).

Ruggedness
The change in analyst with same concentration and environmental condition didn’t affect the results.

Robustness
The change in wavelength (274nm and 280nm) and concentration (10µg/ml) didn’t affect the results.

Assay
The assay was performed by using Veenat 100mg at concentration 10µg/ml. The % purity was found to be 98.2%.

MATERIAL AND METHODS

Materials
Imatinib was take as gift sample from, Microlab Pvt. Ltd. Bengluru. Methanol was taken of analytical grade.

Instruments
Analytical balance (Shimadzu AY220), Sonicator (Oscar ultrasonicator microclean 103), UV-Visible double beam spectrophotometer (Systronic 2201).

Experimental
Preparation of standard stock solution
Accurately weighed 10mg of Imatinib transferred to 100ml volumetric flask. It was dissolved and sonicated for 10minutes. The volume was made up to mark with same diluent to obtain final strength.

Procedure for plotting calibration curve
For calibration curve in a series of 10ml volumetric flasks, 0.4-2ml of standard solution was pipetted out separately. The volume was completed to the mark using methanol. The absorbance was measured at wavelength 274nm against blank solution.

Analysis of Imatinib in Capsule formulation
10mg equivalent Imatinib was weighed and transferred to the 100ml volumetric flask and dissolved in methanol as a solvent. After that sonicated for 10min and vortex for 5min. 1ml of above solution was pipetted out and transferred to the 10ml volumetric flask and make up the volume upto the mark with same solvents and analysed at 274nm. Calculate the % purity of imatinib.

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### Table No.1: Results of Linearity

| S.No | Concentration (µg/ml) | Absorbance  |
|------|-----------------------|-------------|
| 1    | 4                     | 0.201       |
| 2    | 8                     | 0.397       |
| 3    | 12                    | 0.602       |
| 4    | 16                    | 0.819       |
| 5    | 20                    | 0.998       |

### Table No.2: Optimization parameters of Imatinib

| S.No | Parameters                        | Method values          |
|------|-----------------------------------|------------------------|
| 1    | Maximum Wavelength                | 274nm                  |
| 2    | Beer’s Law                        | 4-20µg/ml              |
| 3    | Correlation Coefficient ($r^2$)   | 0.9993                 |
| 4    | Regression Equation               | $y = 0.0504x + 0.0014$ |
| 5    | Slope (m)                         | 0.0504                 |
| 6    | Intercept (c)                     | 0.0014                 |

### Table No.3: Results of Accuracy

| S.No | Name of Drug | Recovery Level | Concentration | Amount Recovered | % recovery with SD |
|------|--------------|----------------|---------------|------------------|--------------------|
| 1    | Imatinib     | 50             | 4µg/ml        | 4.05             | 100.05±0.25        |
|      |              | 100            | 8µg/ml        | 8.03             | 99.03±0.7          |
|      |              | 150            | 12µg/ml       | 12.04            | 100.06±0.04        |

### Table No.4: Results of Intra-day Precision

| S.No | Concentration | Absorbance |
|------|---------------|------------|
| 1    | 12(µg/ml)     | 0.602      |
| 2    |               | 0.601      |
| 3    |               | 0.602      |
| 4    |               | 0.603      |
| 5    |               | 0.601      |
| 6    |               | 0.604      |
| 7    | SD            | 0.001169   |
| 8    | %RSD          | 0.19414    |

### Table No.5: Results of Inter-day precision

| S.No | Concentration | Absorbance (Day1) | Absorbance (Day2) |
|------|---------------|-------------------|-------------------|
| 1    | 12(µg/ml)     | 0.602             | 0.604             |
| 2    |               | 0.601             | 0.603             |
| 3    |               | 0.602             | 0.604             |
| 4    |               | 0.603             | 0.605             |
| 5    |               | 0.601             | 0.602             |
| 6    |               | 0.604             | 0.604             |
| 7    | SD            | 0.001169          | 0.001033          |
| 8    | %RSD          | 0.19414           | 0.171087          |

### Table No.6: Results of LOD and LOQ

|        |        |
|--------|--------|
| LOD    | 0.68µg/ml |
| LOQ    | 2.06µg/ml |
Table No.7: Results of Ruggedness

| S.No | Concentration | Absorbance (Analyst1) | Absorbance (Analyst2) |
|------|---------------|-----------------------|-----------------------|
| 1    | 10µg/ml       | 0.485                 | 0.486                 |
|      |               | 0.487                 | 0.485                 |
|      |               | 0.484                 | 0.487                 |
|      |               | 0.488                 | 0.486                 |
|      |               | 0.485                 | 0.485                 |
|      |               | 0.486                 | 0.485                 |
| 2    | Average       | 0.485833              | 0.485667              |
| 3    | SD            | 0.001472              | 0.000816              |

Table No.8: Results of Robustness

| Wavelength | 274nm | 280nm |
|------------|-------|-------|
| Concentration | 10µg/ml | 10µg/ml |
| Absorbance  |       |       |
| 0.485   | 0.484 |
| 0.487   | 0.487 |
| 0.484   | 0.483 |
| 0.488   | 0.482 |
| 0.485   | 0.487 |
| 0.486   | 0.484 |
| Average | 0.485833 | 0.4845 |
| SD     | 0.001472 | 0.002074 |

Table No.9: Results of Assay

| S.No | Formulation   | Labeled Amount | Amount obtained | % purity |
|------|---------------|----------------|-----------------|----------|
| 1    | Veenat Capsule | 100mg          | 98.2            | 98.2%    |

Figure No.1: Structure of Imatinib

Figure No.2: UV spectrum of Imatinib
CONCLUSION
An analytical UV spectrophotometric method was developed and validated thoroughly for quantitative determination of Imatinib in bulk and solid dosage form. The presented method was found to be simple, precise, accurate, rugged, reproducible and gives an acceptable recovery of the analyte.

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CONFLICT OF INTEREST
We declare that we have no conflict of interest.

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