International Journal of Research in Pharmacy and Pharmaceutical Sciences
ISSN: 2455-698X; Impact Factor: RJIF 5.22
Received: 04-01-2021; Accepted: 24-01-2021; Published: 27-02-2021
www.pharmacyjournal.in
Volume 6; Issue 1; 2021; Page No. 37-39

Analytical techniques for the estimation of itraconazole in capsule dosage form by spectrophotometric method

Kirtimaya Mishra, N Harish Kumar, Mazma Begum, Subhashree Choudury, Chintapalli Gowri Sankar*
Department of Pharmaceutical Analysis, Jeypore College of Pharmacy, Jeypore, Odisha, India

Abstract
For the determination of Itraconazole in pure formulations and its pharmaceutical formulations, a simple UV-spectrophotometric method was developed. Itraconazole exhibited maximum absorption at 262nm in ethanol and obeyed linearity in the concentration range of 4-14 µg/ml. The method proposed was validated statistically. With good accuracy, all the proposed methods are simple, selective, reproducible, sensitive and precise. Some of the methods were proved to be superior to most of the reported methods. Many of these suggested prediction methods for chosen drugs, such as Itraconazole, have been successfully implemented either in bulk or in prescription formulations. The suggested methods can be used in bulk and prescription dosage formulations as alternative methods to the recorded ones for the routine determination of selected drugs in the sample.

Keywords: itraconazole, UV-visible method, ethanol

Introduction
UV-visible spectrophotometric methods that fall in the 200-800 nm wavelength region and fluorimetric methods are very simple, inexpensive, and easy to estimate bulk-form drugs and their formulations. The drawbacks of certain analytical colorimetric or fluorimetric approaches lie in the chemical reaction on which the systems are based rather than the available instruments. Many of the reactions involve a certain drug's color or fluorescence are very selective or may be made selective by adding masking agents, regulating pH, using solvent extraction methods, changing oxidation states or previous elimination of intervening ingredients with the assistance of separate chromatographic ingredients [1,2,3]. Itraconazole is a powerful triazole antifungal agent that is used to treat mycosis in patients with fungal infections. The drug may be given orally or intravenously.1-3 The IUPAC nomenclature of the drug is as follows: (2R,4S)-rel-1- (butan-2-yl)- 4-{4-[4-(4-{[(2R,4S)-2-(2,4-dichlorophenyl)-2-(1H1,2,4-triazol-1-ylmethyl)-1,3-ioxolan-4-yl]-methoxy}-phenyl)piperazinyl phenyl-4,5-dihydro1H-1,2,4-triazol-5-one. ITZ is used orally for the treatment of dermatophyte infections, superficial fungal infections and systemic fungal infections in the form of capsules. For quality control and stability testing of Itraconazole in pharmaceutical formulations, limited methods have been published, because the drug is not yet official in any pharmacopoeia. Spectro fluorimetry method has been used for assay of Itraconazole in raw material and in dosage forms. RP-HPLC method is used for determination of Itraconazole in human plasma.4-separation in this method was performed on an octadecylsilane column using fluorescence detector [4, 5, 6]. However, it has the disadvantage of being time consuming. All of these findings have demonstrated the need for a fast and sensitive quality-control study of Itraconazole-containing pharmaceutical formulations. Since these methods are costly, we have tried to establish a more Reliable, convenient and economical spectrophotometric approach with greater precision, specificity and sensitivity for the study of Itraconazole in bulk and dosage types.

Materials and Methods
Itraconazole was obtained as gift sample from Elite chemicals and all reagents were purchased from SD Chemicals Chennai. All materials and reagents used were in analytical grade

Method Development
For the identification of Itraconazole in pure form and its pharmaceutical formulation, a simple UV-Visible Spectrophotometric method was developed. Itraconazole demonstrated maximal ethanol absorbance at 262nm and obtained linearity in the 4 to 14 µg/ml concentration range. The method proposed was validated statistically.

Instrumentation
Analytical technologies ltd, T60 UV-Visible Spectrophotometric method was conducted using 1-cm quartz cells.

Selection of Solvent
Ethanol was selected an ideal solvent for spectrophotometric analysis of Itraconazole.

Scanning and Determination of Maximum Wavelength (λmax)
In order to ascertain the wavelengths of maximum absorption (λmax) of the drug, different solutions of the drug (4µg/ml and 14µg/ml) in Ethanol were scanned using UV-Visible spectrophotometer within the wavelength region of 262–380nm against Methanol as blank. The resulting spectrum was presented in Fig 1 and the absorption curve showed characteristic absorption maximum at 262 nm for Itraconazole.

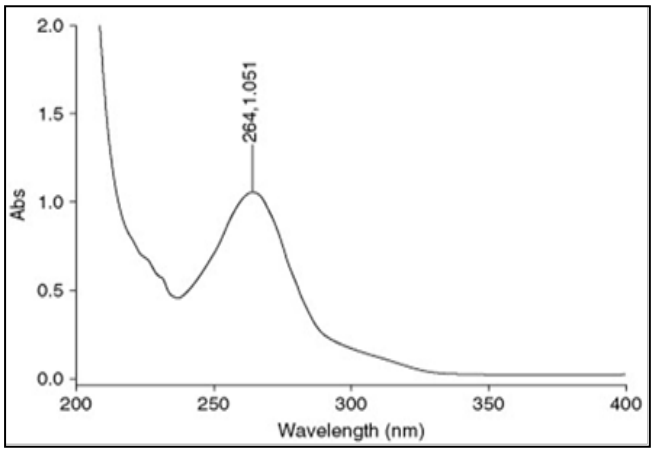

Fig 1: Absorption Spectrum of Itraconazole in Ethanol

Preparation of Stock Solution

Standard stock solution of Itraconazole was prepared by dissolving 10mg of Itraconazole drug in 10ml of Ethanol in 10ml of volumetric flask to get a concentration of 1mg/ml solutions.

Preparation of Working Standard Solutions and construction of standard graph

The prepared stock solution was further diluted with Ethanol to get working standard solutions of 10ug/ml and 100ug/ml. To construct Beer's law plot for Itraconazole different aliquots of Itraconazole were taken and diluted to 10 ml with Ethanol to get the working standard solutions as shown in the table 1. The absorbances of each solution were measured at lmax 262 nm against Ethanol as blank. The results were shown in table1. The standard graph for Itraconazole was plotted by taking concentration of drug on x-axis and absorbance on y-axis and was shown in Fig 2. The drug has obeyed Beer's law in the concentration range of 4-14ug/ml [7].

Estimation of Itraconazole in commercial formulations

For analysis of commercial formulations, 20 capsules containing Itraconazole were taken and powdered. The powder equivalent to 0.010g of Itraconazole was taken in a 10ml volumetric flask, containing 7ml of Ethanol and sonicated for 30 minutes. The volume was made up to 10ml with Ethanol and filtered to get a solution of concentration 1000µg/ml. This was further diluted with Methanol to get a concentration within the linearity range and the absorbances were measured against the blank at 262nm. The results were shown in Table 3.

Table 1: Linearity table of Itraconazole (pure drug) in ethanol at 262 nm

S.no	Concentration (ug/ml)	Absorption
1	4	0.211
2	6	0.300
3	8	0.411
4	10	0.509
5	12	0.613
6	14	0.713

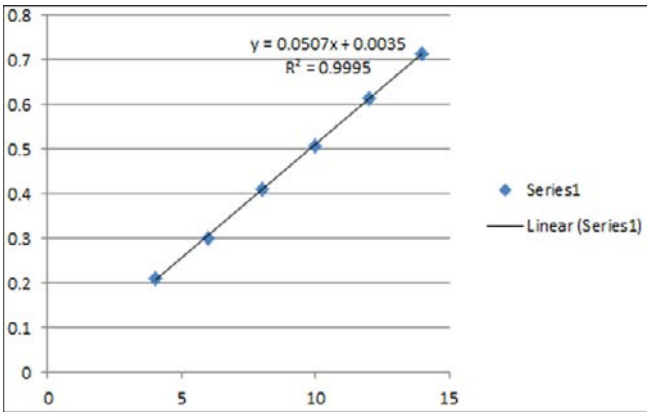

Fig 2: Linearity graph of Itraconazole

Table 2: Optical characteristics of proposed method.

S.NO	Parameter	Itraconazole
1	lmax (nm)	262
2	Beer's Law limit (mg/ml)	4-14
3	Regression equation (Y)	0.090X+0.007
4	Slope (a)	0.090
5	Intercept (b)	0.007
6	% Range of error 95% confidence limits 99% confidence limits	 0.0029 0.0038
7	Correlation co-efficient	0.999

Validation

Precision

The precision of the proposed method was ascertained by actual determination of six replicates of fixed concentration of the drug within the Beer's range and finding out the absorbance's by the proposed method [8]. From this absorbance's Mean, Standard deviations, %R.S. D were calculated. The readings were shown in Table 4.

Accuracy

To determine the accuracy of the proposed method, recovery studies were carried out by adding different amounts (80%, 100% and 120%) of bulk samples of Itraconazole within the linearity range were taken and added to the pre-analyzed formulation of concentration 10mg/ml [9]. From that percentage recovery values were calculated. The results were shown in Table 5.

Table 3: Amount of Itraconazole in formulation by proposed method.

S. No	Formulation	Drug	Labeled amount(mg)	Observed amount	% Recovery
1	Sporanox	Itraconazole	100	97.33±0.1154	97.4

Table. 4: Precision data

S. NO	Concentration(ug/ml)	Absorbance At 262nm
1	10	0.492
2	10	0.501
3	10	0.501
4	10	0.502
5	10	0.501
6	10	0.501
	Mean	0.4999
	S. D	0.0037
	% R.S.D	0.75415

Table 5: Accuracy data

80%						
S.NO	**Conc(bulk)**	**Conc(formln)**	**%Recovery**	**Mean**	**S. D**	**%R.S. D**
1	8	10	97.4	96.66%	0.635	0.656
2	8	10	96.3			
3	8	10	96.3			
100%						
4	10	10	98.7	98.36%	0.577	0.586
5	10	10	97.7			
6	10	10	98.7			
120%						
7	12	10	98.8	98.2%	0.519	0.528
8	12	10	97.9			
9	12	10	97.9			

Summary

Pharmaceutical research basically means that pharmaceuticals are analysed. Today, pharmaceutical research requires much more than an analysis of active pharmaceutical ingredients or a manufactured substance. The pharmaceutical industry is subject to heightened government and public stakeholder oversight to reduce costs and to reliably bring healthy, efficient drugs to the consumer that address unmet patient needs. In maintaining the origin, safety, effectiveness, purity, and consistency of a drug product, the pharmaceutical analyst plays a significant role [10]. The need for pharmaceutical analysis is primarily motivated by regulatory specifications. In general, the widely used pharmaceutical research tests include the development of compendia testing system, establishing criteria and evaluation of methods. One of the most interesting ways for scientists to take part in the quality process is by empirical research, which offers real evidence on the identification, substance and purity of drug products. With a great deal of commitment to global harmonization, new approaches are now being developed. As a consequence, it is possible to ensure that emerging goods have similar consistency and can be taken more easily to foreign markets.

Pharmaceutical research plays a pivotal role in the statutory approval, either by industry or by regulatory bodies, of medicines and their formulations. In industry, the divisions of quality assurance and quality management play a significant role in delivering a safe and reliable type of prescription or dose. The latest Good Manufacturing Practices and the recommendations of the Food Drug Administration (FDA) insist that sound analytical methods with greater specificity and reproducibility be followed. The sophistication of the problems encountered in pharmaceutical research is therefore critical for achieving the selectivity, speed, low cost, simplicity, specificity, sensitivity, accuracy and precision of drug estimation.

Conclusion

The method proposed was simple, sensitive and accurate with good precision and accuracy. The proposed approach is precise when calculating commercial formulations without intervention from excipients and other additives. This approach can also be used for the regular assessment of Itraconazole in bulk samples and pharmaceutical formulations.

Acknowledgement

The authors express their gratitude to the Management, Jeypore College of Pharmacy, Jeypore for providing their continuous support throughout the work. The authors are also grateful to Mr. Saswat Kumar Rath, Mr. Rama Krushna Gouda and Mr Sudhir Kumar Dash for their continuous encouragement and valuable inputs and cooperation while carrying out this study.

References

1. Kasekar M, Godiyal C, Jadhav R. *et al*. Development and Validation of a Simple and Rapid HPLC Method for Determination of Itraconazole in Bulk and Marketed Formulation. Der Pharmacia Lettre. 2017; 9(10):36-43.
2. Chinmoy R, Chakrabarty J, Hitesh B. *et al*. Development and Validation of a Stability Indicating Binary RP-UPLC Method for Determination of Itraconazole in Capsules dosage form. International Journal of Analytical and Bioanalytical Chemistry. 2012; 2(3):165-174.
3. Koteswara Rao M, Ramanjaneyulu KV, Reehana SK. *et al*. Method Development and Validation of Itraconazole by UV-Spectrophotometer. World Journal of Pharmaceutical Research. 2014; 3(10):777-787.
4. Parik K, Patel D, Dave JB, Patel CN. *et al*. Development and Validation of Uv Spectrophotometric Method for Estimation of Itraconazole Bulk Drug and Pharmaceutical Formulation. International Journal of Drug Development & Research. 2011; 3(2):324-328.
5. Kirtimaya M, Aditya Prasanna K, Snigdha Rani B. Simultaneous Estimation of Sacubitril and Valsartan in Bulk and Pharmaceutical Dosage Form by Using RPHPLC. Research Journal of Pharmacy and Life Sciences. 2020; 1(2):25-32.
6. Kirtimaya M, Snigdha Rani B, Gowri Sankar CH, Sujit Kumar M. Development and Validation of Stability Indicating Assay Method (Siam) for Rabeprazole in Rabeprazole Sodium Delayed Release Tablets Using HPLC. Research Journal of Pharmacy and Life Sciences. 2020; 1(3):89-97.
7. Kirtimaya M, Snigdharani B, Sruti Ranjan M, Somesu M, Kiran Kumar BA. Validated Stability Indicating RP-HPLC Method Development for Platelet Aggregation Inhibitor Ticagrelor in Bulk and Tablet Formulation. Journal of Global Pharma Technology. 2019; 11(12):12-18.
8. Kirtimaya M, Saragi B, Kiran Kumar B. Simultaneous Estimation of Sertraline and Alprazolam in its Bulk and Tablet Dosage Form by RP-HPLC Method. Asian Pacific Journal of Pharmacy and Phytochemistry. 2016; 1(1):25-32.
9. Kirtimaya M, Kiran Kumar B, MuthuKumari M, Subrahmanyam BSS. New Analytical Method Development and Validation of Chlorpheniramine Maleate by Using Uv-Visible Spectrophotometry. Indo American Journal of Pharmaceutical Sciences. 2016; 3 (7):767-772.
10. Kirtimaya M, Balamurugan K, Suresh R Linagliptin: A Literature Review on Analytical and Bioanalytical Methods. International Journal of Pharmaceutical Quality Assurance. 2018; 9(3):225-230.