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SIMULTANEOUS ESTIMATION OF SATRANIDAZOLE AND CIPROFLOXACIN BY RP-HPLC METHOD IN TABLET DOSAGE FORM

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ABSTRACT

A simple, accurate and precise reverse phase high performance liquid chromatographic method has been developed and validated for the estimation of satranidazole and ciprofloxacin simultaneous determination in combined dosage forms. A Lichrospher 100 RP-180, C_{18} column was used as stationary phase and mobile phase contain water : Acetonitrile : triethylamine (75 : 25 : 0.1, v/v/v) and final pH adjusted to 3.25 ± 0.02 with 10 % v/v *o*-phosphoric acid. Measurements were made at the effluent flow rate of 1.0 mL/min with injection volume 20 µl and ultraviolet (UV) detection at 320 nm, as both components shows reasonable good response at this wavelength. The retention times of satranidazole and ciprofloxacin were 5.38 min and 3.31 min, respectively. The method was validated in terms of linearity, accuracy, precision, robustness and specificity. Linearity of satranidazole and ciprofloxacin was in the range of 1-70 µg/mL for both, respectively. Average percentage recoveries obtained for satranidazole and ciprofloxacin were 100.14 % and 101.03 %, respectively. The limit of detection and limit of quantification were found to be 0.3 and 1.0 µg/mL for satranidazole, respectively and for ciprofloxacin were 0.6 and 1.0 µg/mL, respectively. The method is useful in the quality control of bulk manufacturing and pharmaceutical dosage forms.

Key words : Satranidazole, Ciprofloxacin, RP-HPLC, Simultaneous estimation

INTRODUCTION

Satranidazole (SAT), is chemically described as 3-(1-methyl-5-nitroimidazol-2-yl)-1-ethylsulfonyl) imidazolidin-2-one[1] and chemically ciprofloxacin (CIP) is -cyclopropyl–6–fluoro–1, 4–dihydro–4–oxo–7-(1–piperazinyl)-3–quinoline carboxylic acid[2]. Literature survey reveals that few HPLC and spectrophotometry methods are reported for the estimation of satranidazole and ciprofloxacin in biological samples such as plasma[3-13]. So far no HPLC method has been reported for the simultaneous estimation of satranidazole

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and ciprofloxacin in combined dosage forms. In the present investigation, an attempt has been made to develop accurate and precise HPLC method for the simultaneous estimation of satranidazole and ciprofloxacin in combined dosage forms.

EXPERIMENTAL

Materials and methods

Satranidazole and ciprofloxacin standards were procured as a gift sample from Torrent Research Centre, Ahmedabad. Acetonitrile and water used were of HPLC grade and were purchased from Rankem, India. Triethylamine and *o*-phosphoric acid were of AR grade from S. D. Fine Chemicals Ltd., Mumbai. A synthetic mixture was prepared in the laboratory comprising of SAT (25 mg) and CIP (10 mg) in the proportion of 5 : 2 (w/w)[14]. A Merck - Hitachi Isocratic High Performance Liquid Chromatography with a Lichrospher 100 RP-180, C-18, 5 μm column having 250 x 4.0 mm internal diameter and equipped with Hitachi pump L – 7110, Rheodyne universal injector 77251 with injection volume 20 μL and Hitachi L - 7420 UV - Visible detector and monitored by Merck - Hitachi HSM software, was used.

Preparation of standard and sample solutions

Accurately weighed SAT (25.0 mg) and CIP (25.0 mg) was transferred to a 25 mL volumetric flask, dissolved in and diluted up to the mark with water. Ten mL aliquots each from stock solutions of SAT and CIP were transferred and mixed in 100 mL volumetric flask and volume was made up with mobile phase up to mark to get 100 μg/mL mixed standard stock solution.

A synthetic mixture was prepared in the laboratory comprising of SAT and CIP in the proportion of 5 : 2 (w/w). Accurately weighed SAT (25 mg) and CIP (10 mg) was transferred to a 100 mL volumetric flask and dissolved in and diluted to mark with water. The solution (2.0 mL) was transferred to a 10 mL volumetric flask and diluted to the mark with mobile phase to obtain final solution with SAT (50 μg/mL) and CIP (20 μg/mL).

HPLC method and chromatographic conditions

The chromatographic separations were performed using LiChrospher® 100 C18, 5 μm, 250 × 4.0 mm i. d. column, at ambient temperature. The mobile phase comprised of water : acetonitrile : triethylamine (75 : 25 : 0.1, v/v/v) and final pH adjusted to 3.5 ± 0.02 with 10 % v/v *o*-phosphoric acid and was pumped at a flow rate of 1.0 mL/min. The mobile phase was filtered through nylon 0.45 μm - 47 mm membrane filter and was

degassed before use. The elution was monitored at 320 nm. The injection volume was 20 µL.

Calibration curve

Appropriate aliquots from standard stock solution of mixed drugs were suitably diluted with mobile phase in such a way to get concentrations in a range of 1-100 µg/mL for both the drugs. These solutions (n = 5) were injected into the universal injector 77251 (Rheodyne) with injection volume 20 µL. Evaluation of two drugs was performed with UV/Visible detector at 320 nm. Peak areas were recorded for all the peaks. The plots of peak area versus the respective concentration of SAT and CIP were found to be linear in the range of 1-70 µg/mL for both the drugs. Calibration curves were constructed by plotting peak areas versus concentrations of SAT and CIP and the regression equations were calculated.

Validation of the method[15]

The developed method was validated in terms of linearity, accuracy, limit of detection, limit of quantification, intra-day and inter-day precision and repeatability of measurement as well as repeatability of sample application.

RESULTS AND DISCUSSION

The published literature for the estimation of other antibacterial drug in combination and knowledge of the molecule suggest that reverse phase liquid chromatography (RPLC) is suitable for the simultaneous analysis of SAT and CIP. In RPLC, lichrospher® 100 rp-180, C_{18}, column having 250 mm length, 4.0 mm internal diameter and 5 µm particle size was used.

As per the value of Ka and solubility of both the compounds, various compositions of mobile phase with different pH ranges (2.75 to 7.0) were tried and best resolution was obtained with mobile phase consisting of water, acetonitrile and triethylamine in the proportion of 75 : 25 : 0.1 (v/v/v) with final pH adjusted 3.5 ± 0.02 with 10% v/v *o*-phosphoric acid. Quantification was achieved with UV detection at 320 nm based on peak area. Better resolution of the peaks with clear base line separation was found. Retention time for SAT and CIP was 5.38 min and 3.31 min, respectively. System suitability tests were carried out on freshly prepared standard stock solutions of SAT and CIP and parameters obtained are summarized (Table 1).

Table 1 : Validation and system suitability parameters

Parameters	Values	
	SAT	**CIP**
Retention time (min)	5.38	3.31
Tailing factor (n = 5)	1.196	0.693
Asymmetry (n = 5)	1.53	1.696
Theoretical plates (n = 5)	4536.89	2697.64
Linearity range (μg/mL)	1-70 μg/mL	1-70 μg/mL
Limit of detection	0.3 μg/mL	0.6 μg/mL
Limit of quantification	1.0 μg/mL	1.0 μg/mL

Intra- and Inter-day precision studies were carried out and results show that the method is reproducible. Limit of detection and limit of quantification were found to be 0.3 and 1.0 μg/mL for SAT, respectively and 0.6 and 1.0 μg/mL for CIP, respectively (Table 1). The results obtained by the proposed method were close to the label claim of both the drugs (Table 2).

Table 2 : Analysis of sat and cip

Formulation	Drug	Labeled taken amount (mg)*	Amount found (mg)	% Amount found ± S. D. (n = 5)
Bulk powder	Satranidazole	25	24.31	98.61 ± 1.23
	Ciprofloxacin	10	9.86	97.24 ± 1.53

The low value of standard deviation indicates that the method is accurate. To study the accuracy of the proposed method, recovery experiments were carried out. A fixed amount of pre-analyzed sample was taken and standard drug was added at three different concentrations. The values of percentage recovery show that the proposed method is accurate (Table 3).

Table 3 : Recovery study of sat and cip

Drug	Amount taken (µg/mL)	Amount added (µg/mL)	% Recovery ± S. D (n=5)
Satranidazole	25	10	100.34 ± 0.19
	25	25	101.08 ± 0.59
	25	35	99.00 ± 1.23
Ciprofloxacin	10	5	101.60 ± 0.25
	10	10	101.61 ± 1.32
	10	20	99.90 ± 1.78

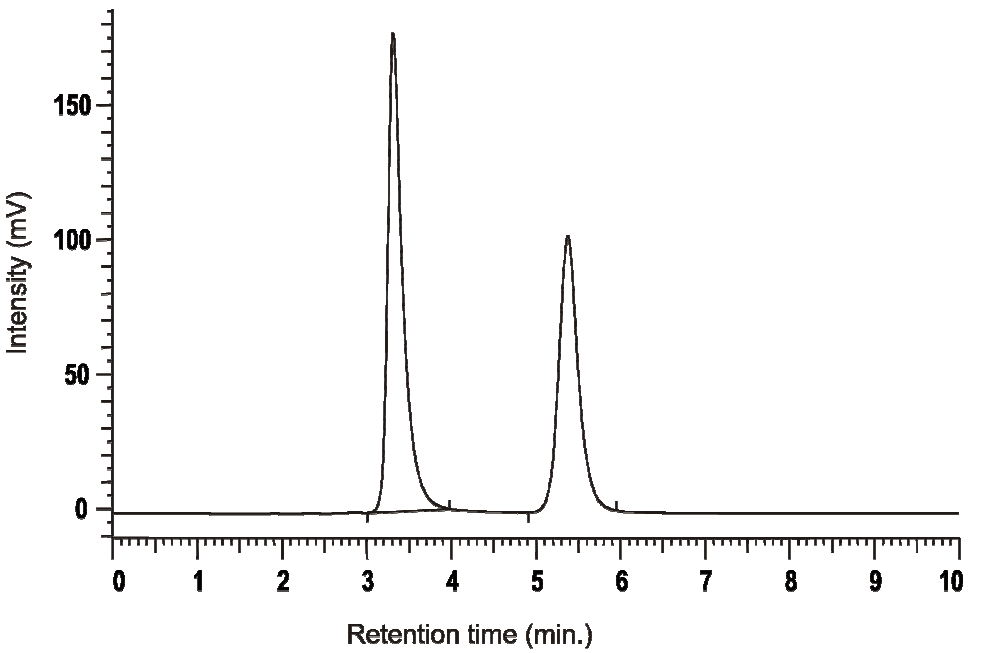

Fig. 1 : A typical RPLC chromatogram of SAT and CIP

The proposed method is accurate, precise, repeatable and reproducible and can be used for routine analysis of SAT and CIP in combination tablets.

CONCLUSION

The developed RPLC technique is simple, precise, specific and accurate and the statistical analysis proved that method is reproducible and selective for the analysis of SAT and CIP in bulk drug and tablet formulations.

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REFERENCES

1. R. K. Goyal, in, Elements of Pharmacology, 15th Ed., Ahmedabad , B. S. Shah Prakashan, (2005) p. 481.
2. M. Shobha and R. S. Appala, The East. Pharma., **25,** 115 (2001).
3. S. A. Raju, M. Shobha and S. Manjunath, Asian J. Chem., **14**, 520 (2002).
4. H. Ma, X. Zheng and Z. Zhang, Luminesce., **20,** 303 (2005).
5. V. Jatav, S. K. Kashaw and P. Mishra, Indian J. Pharm. Sci., **67,** 482 (2005).
6. S. M. Sultan and F. O. Suliman, Analyst., **117,** 1523 (1992).
7. S. P Agraval and S. Baboota, Indian J. Pharm. Sci., **63,** 345 (2001).
8. S. Imre, M. T. Dogaru, C. E. Vari, T. Muntean and L. Kelemen, J. Pharm. Biomed. Anal., **33**, 125 (2003).
9. A. E. Mansilla, A. M. Pena, F. Canada-Canada and D. G. Gomez, Anal. Biochem., **156**, 341 (2005).
10. M. Kamberi, K. Tsutsumi, T. Kotegawa, K. Nakamura and S. Nakano. Clin. Chem., **44**, 1251 (1998)
11. V. F. Samanidou, E. A. Christodoulou and I. N Papadoyannis, J. Sep. Sci., **28,** 325 (2000)
12. L. A. Shervington, M. Abba, B. Hussain and J. Donnelly, J. Pharm. Biomed. Anal., **39**, 769 (2005).

13. V. Phani Sekhar, P. Ramachandrudu, S. Kanna Bapu and B. Murali Krishna, Eastern Pharma., **44,** 113 (2001).

14. P. U. Patel, B. N. Suhagia, C. N. Patel, M. M. Patel, G. C. Patel and G. M. Patel, Indian J. Pharm. Sci., **67**, 356 (2005).

15. Validation of Analytical Procedures, Methodology, ICH Harmonized Tripartite Guidelines, 1 (1996).

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