NOTE

Spectrophotometric Determination of Gatifloxacin

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A simple and sensitive method was developed for the determination of gatifloxacin in pure and dosage form. The method was based on the oxidative coupling reaction of gatifloxacin with 3-methyl-2-benzothiazolinone hydrazone in the presence of an oxidizing agent like ceric ammonium sulphate. The chromogen attained a green colour and exhibited absorption maxima at 630 nm. Good agreement with Beer's law was found in the range of 2–10 µg/mL. The method did not require any separation of soluble excipients in the formulation. The results obtained are reproducible with coefficient of variation less than 1.0%.

Key Words: Spectrophotometric, Determination, Gatifloxacin.

Gatifloxacin[1] (GTL) is a synthetic broad-spectrum 8- methoxy fluoroquinolone antibacterial agent. Chemically gatifloxacin[1] is (±)-1-cyclopropyl-6-fluoro-1,4-dihydro-8-methoxy-7-(3-methyl-1-piperazinyl) 4-oxo-3-quinoline carboxylic acid sesquihydrate. Literature survey reveals few HPLC[2-5] methods and an extractive spectrophotometric[6] method for the estimation of GTL. In the present investigation, a simple spectrophotometric method was developed for the determination of GTL in bulk and pharmaceutical formulations. Gatifloxacin reacts with 3-methyl-2-benzothiazolinone hydrazone (MBTH) in the presence of the oxidant ceric ammonium sulphate, to form a green coloured chromogen showing absorption maxima at 630 nm. By this method gatifloxacin obeys Beer's law in the concentration range of 2–10 µg/mL.

All spectral and absorbance measurements were carried out on Jasco V-530 spectrophotometer model 117 with 10 mm matched quartz cells. The pure drug was obtained as a gift sample from Sun Pharmaceuticals, Gujarat. All reagents used were of analytical grade. Aqueous solution of MBTH (0.2%) was prepared in distilled water. Cerric ammonium sulphate (0.5%) was prepared in 0.36 N H_2SO_4.

A standard solution of gatifloxacin containing 1 mg/mL was prepared by dissolving 100 mg of gatifloxacin in 10 mL of 0.1 N HCl and then the volume was made up to 100 mL with distilled water. Further dilutions were made with the stock solution to produce 20 µg/mL.

Aliquots of working standard solution ranging from 1.0–5.0 mL were transferred into a series of calibrated 10 mL volumetric flasks. To each flask 1.0 mL of MBTH (0.2%) and 2.0 mL Ce(IV) (0.5%) was added, mixed and allowed to stand for 7 min for the completion of the reaction. Then the volume was made up to 10 mL with

distilled water and the absorbance of the green coloured chromogen was measured at 630 nm against reagent blank within 30 min.

For the analysis of dosage form, 20 tablets was weighed accurately and powdered and an amount equivalent to 100 mg of gatifloxacin was dissolved in 10 mL of 0.01 M HCl and then made up to 100 mL with 0.01 M HCl. It was filtered and further dilutions were carried out to obtain 20 μg/mL. The amount of GTL present in the sample drug solution was found out by carrying out the procedure as mentioned in the standard drug assay and computed from the calibration curve.

The optical characteristics such as Beer's law limits, Sandell's sensitivity, molar extinction coefficient, per cent relative standard deviation and % range of error are summarized in Table-1. The regression analysis using the least squares was made for slope (a), intercept (b) and correlation coefficient (r) obtained from different concentrations and the results are summarized in Table-1. Taking known amounts of gatifloxacin within Beer's law range and estimating these amounts with the proposed method determined the accuracy of the method. The results are presented in Table-2.

TABLE-1
OPTICAL CHARACTERISTICS AND PRECISION DATA

Parameters	Proposed Method
λ_{max} (nm)	630
Beer's law limit (μ/mL)	2–10
Sandell's sensitivity (μ/cm^2/0.001 absorbance unit)	0.58910
Molar absorptivity (L mol^{-1} cm^{-1})	6.5998×10^3
% RSD	0.628
% Range of error:	
0.05 confidence limits	0.5250
0.01 confidence limit	0.7769
Correlation coefficient	1.001
Regression equation (y*):	
Slope (a)	1.706×10^{-3}
Intercept (b)	0.1016

*Average of eight determinations.   **Y = a + bC, where C is concentration of analyte.

TABLE-2
PER CENT RECOVERY BY THE PROPOSED METHOD

Drug	Label claim (mg)	Amount found by proposed method (mg/tab)	Reference method	Recovery (%)
Tablet	400	399.23	398.8	99.98

Gatifloxacin may have undergone oxidative coupling reaction with MBTH in the presence of cerric ammonium sulphate. Oxidation with Ce(IV), MBTH loses two electrons and a proton to give an electrophilic intermediate (II). On addition of the drug, electrophilic substitution takes place and the colored compound (III) is produced. Coupling takes place ortho to the nitrogen in the quinolone ring as shown since the *para* position is not free (Scheme-1).
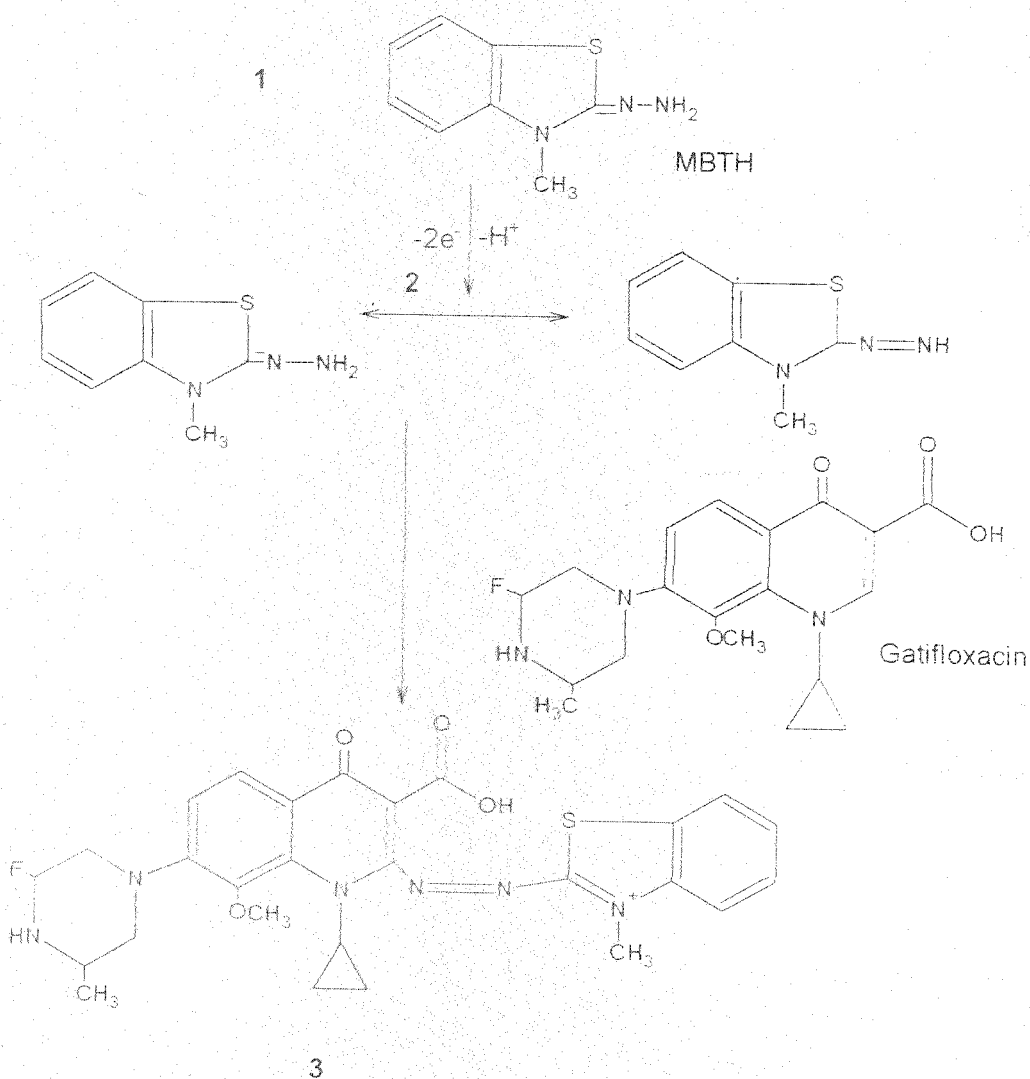
1. MBTH,   2. Electrophilic intermediate,   3. Coloured product

REFERENCES

1. CMS, Drugs Profile, Biogard Pvt. Ltd., Bangalore, India (2003).

2. H. Liang, M.B. Kays and K.M. Sowinski, *J. Chromatogr. B: Analyt. Techno. Biomed. Life Sci.*, **53,** 772 (2002).

3. J.W. Hong, C.Q. Hu and L.S. Sheng, *Yao Xue Bao*, **38,** 695 (2003).

4. B.R. Overholser, M.B. Kays and K.M. Sowinski, *J. Chromatogr. B: Analyt. Techno. Biomed. Life Sci.*, **167,** 798 (2003).

5. T.R. Shirke and P. Nandini, *Asian J. Chem.*, **16,** 546 (2004).

6. K.V.S. Prabhakar, G. Murali, S.V.M. Rao, M. Sandhya and G. Jagganath, *Asian J. Chem.*, **15,** 1170 (2003).