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Determination of Gemifloxacin and Ambroxol in Pharmaceutical dosage form by Simultaneous and Q-analysis UV-Spectrophotometric method

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ABSTRACT

Two simple, accurate and precise UV methods were developed for the estimation of Gemifloxacin (GEM) and Ambroxol (AMB) in Bulk drug form. Both the drugs are used in treatment of chronic bronchitis and mild to moderate pneumonia and muscle spasm.

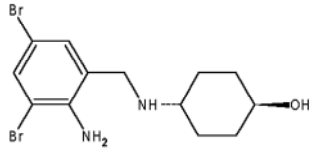
Method A is Simultaneous equation method; wavelengths selected for Quantitation are 271.0 nm and 245.5 nm for Gemifloxacin (GEM) and Ambroxol (AMB) respectively which are the λmax of both the drugs. Method B is Q –Analysis method, wavelengths selected were 245.5nm (λmax of AMB) and 244.0 nm (Isobastic point) for the analysis. In both the methods linearity for detector response was observed in the concentration range of 10-60mcg/ml for GEM and 2-12 AMB respectively. The results of bulk drug analysis for method A is found to be 99.66% ± 0.49 S.D for GEM and 99.99% ± 0.08 S.D for AMB and results obtained for Method B is 99.75% ± 0.41 S.D for GEM and 99.77 % ± 0.44 S.D for AMB. The proposed methods were successfully applied for the simultaneous determination of both the drugs in commercial tablet preparation. The results of the analysis have been validated as per ICH guidelines.

KEYWORDS: Gemifloxacin and Ambroxol, UV-Spectrophotometry, Simultaneous equation method, Q-Analysis method, UV method.

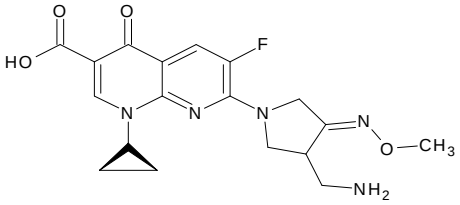
INTRODUCTION:

Gemifloxacin (GMF) is chemically R,S-7-(3 amino methyl 4- syn methoxyimino-1pyrrolidinyl)-1cyclopropyl-6-flouro1,4,dihydro 4- oxo-1,8 napthyridine-3-carboxylic acid methane- sulphonate is a new flouroquinolone antibacterial compound with enhanced affinity for bacterial topoisomerase - IV and is being used for the treatment of respiratory and urinary tract

infections, light brown powder, freely soluble in water and slightly soluble in Methanol. Ambroxol hydrochloride (AMB) is chemically, 4-[(2-amino-3,5-dibromophenyl)-methyl]-amino] cyclohexanol hydrochloride is a mucolyticexpectorant and used to reduce the viscosity of mucous. Literature survey revealed that few analytical method have been reported for the estimation of gemifloxacin, rapid and sensitive LC method for analysis of gemifloxacin in human plasma, spectrophotometric determination of gemifloxacin mesylate in pharmaceutical formulation trough ion-pair complexation and validated stability indicating assay of Gemifloxacin and lomefloxacin in tablet formulation by capillary electrophoresis.



Structure of Ambroxol



Structure of Gemifloxacin

MATERIAL AND METHODS:

Instruments: UV-Visible Spectrophotometer (Double Beam)

Make: Jasco

Model: UV V-630 Spectrophotometer

Spectral Bandwidth: 2nm

Materials:

Standard gift sample of Gamifloxacin and Ambroxol were provided by Hetro Drugs Ltd., H.P

Solvent used: Distilled water used as solvent.

Stock solution:

Stock solution of both the drugs100mcg/ml is prepared by dissolving 10mg each drug in100ml volumetric flask and the volume is make up by distilled water.

Procedure:

Method A - Simultaneous Equation method:

In this method, the stock solution of both the drugs 100mcg/ml is prepared by dissolving 10mg each drug in100ml volumetric flask and the volume is makeup by distilled water. By appropriate dilution of standard stock solutions of both the drugs to 20mcg/ml dilution respectively is scanned in the spectrum mode from 400nm to 200 nm. The absorption spectra thus obtained is selected for analysis, from the overlain spectra of both the drugs (fig.1), wavelength selected for Quantitation are 271 nm and 244 nm for Gamifloxacin and Ambroxol and which are the λmax of both the drugs. The calibration curves for Gamifloxacin and and Ambroxol concentration range of 10-60 mcg/ml for GEM and 2-12 mcg/ml for Ambroxol exhibiting the Beer's and Lamberts range. The concentration of individual drug present in the mixture was determined by using the simultaneous equation calculations.

Method B - Q Analysis method:

For the selection of Analytical wavelength, solution of GEM and AMB (10 mcg/ml, each) were prepared separately by appropriate dilution of standard stock solution and scanned in the spectrum mode from 400 nm to 200 nm. From overlain spectra of both the drugs (fig.1), wavelengths selected were 271 nm and 244.0 nm (Isobastic point) for the analysis. The Q values of both the drugs were determined at the selected wavelength. The Q value is the ratio of Absorbance of std.1 at 271.0 nm to the Absorbance of std.2 at 244.50 nm. Molar Absorptivities for both the drugs were calculated by Absorbance of std.at 244.0 nm with the concentration in gm/lit. A set of two simultaneous equations obtained by using 'Q' values are given below.

$C_{GEM} = Q0 - Q_{AMB} / Q_{GEM} - Q_{AMB} x\ A / a_{GEM}$ ---------- (1)

$C_{AMB} = Q0 - Q_{GEM} / Q_{AMB} - Q_{GEM} x\ A / a_{AMB}$---------- (2)

C_{AMB} C_{GEM} was concentration of AMB and GEM, respectively. The concentration of AMB and GEM in sample was determined by using the equation (1) and (2).

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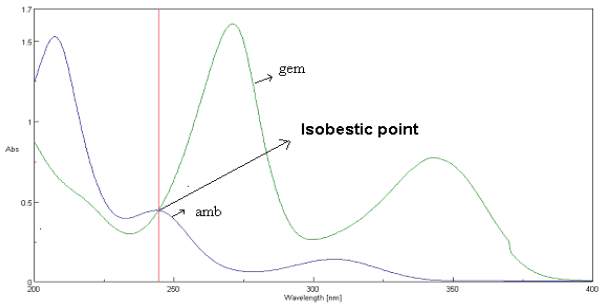

Fig-1: Overlain spectra of GEM and AMB for method A and B

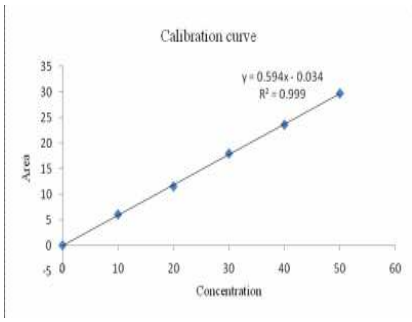

Figure 2: Calibration curve of GEM

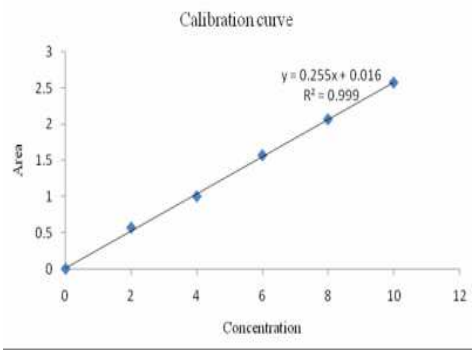

Figure 2: Calibration curve of AMB

RESULTS AND DISCUSSION:

The methods discussed in the present work provide a convenient and accurate way for simultaneous analysis of GEM and AMB. In simultaneous equation method wavelength selected for Quantitation were 277.0 nm for GEM and 244.50 nm for AMB. In Q - Analysis method the

wavelength selected were 271.0 nm and 245.50nm (Isobastic point). In both the methods linearity for detector response was observed in the concentration range of 2-12mcg/ml for GEM and AMB both. In method A, concentration of individual drug present in the mixture was determined against calibration curve in Quantitation mode .In method B, Q values were calculated for both the drugs at selected wavelengths and substituted in equations for determining the concentration of GEM and AMB in Bulk drug sample solution. Percent label claim for GEM and AMB in tablet analysis by both the methods was found in the range of 99.79% to 100.02%. Standard deviation and coefficient of variance for six determination of tablet sample, by both the methods was found to be less than ±2.0 indicating precision of both the methods. Accuracy of both the methods was ascertained by recovery studies and the results are expressed as % recovery. Percent recovery for GEM and AMB by both the methods was found in the range of 99.79% to 101.02%, values of standard deviation and coefficient of variation was satisfactorily low indicating the accuracy of both the methods. The result of analysis shows that the developed methods are accurate, precise, reproducible and economical and can be employed for routine quality control analysis off Gamifloxacin and Ambroxol Hydrochloride in combined dose formulation.

Table 1: Results from Accuracy Recovery studies

Method	Level of % Recovery	Amt. Present (mcg/tab)		Amt. of standard added (mcg/tab)		Total Amt. recovered (mcg)		% Recovery	
		GEM	AMB	GEM	AMB	GEM	AMB	GEM	AMB
Simultaneous equation	80	35.6	8.4	28.48	6.72	64.31	15.09	100.37	99.86
	100	35.6	8.4	35.6	8.4	71.28	16.77	100.12	99.87
	120	35.6	8.4	42.42	10.08	77.78	18.53	99.95	100.30
Q Analysis	80	35.6	8.4	28.48	6.72	64.06	15.13	99.98	100.12
	100	35.6	8.4	35.6	8.4	71.17	16.79	99.97	99.96
	120	35.6	8.4	42.42	10.08	77.81	18.47	99.99	99.98

Table 2: Result of Validation Parameters

Parameters	Method A		Method B	
	GEM	AMB	GEM	AMB
λ_{max}	271	244.5	271	244.5
Beer s low limit µg/ml	10-60	2-12	10-60	2-12
Slope(b)	7.4416	18.3972	7.3316	18.4044
Intercept(a)	0.5849	0.1086	0.5449	0.1405
coefficient Correlation	0.9989	0.9993	0.9989	0.9995
Regression Equation(y=a+bx)	0.594x+0.034	0.255x+0.016	0.494x+0.024	0.245x+0.014
LOD	0.217	0.015	0.220	0.088
LOQ	0.658	0.048	0.640	0.039

y = a + bx, where x is concentration in µg/ml, y is amplitude (Absorbance and ΔA) for Methods,

LOD= limit of Detection, LOQ= limit of quantitation

ACKNOWLEDGEMENTS:

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REFERENCES:

1) Jeffery,G.H., Bassat,J. Mendham,J. Denny,R.C. 1989 :Vogel's Textbook of Qualitative Chemical Analysis**.** 5thedition. Atkin. ELB Swithlongman Publication. Harlow; 3.
2) B. K. Sharma. Instrumental methods of chemical analysis. 2000, Introduction to analytical chemistry. 19th edition. Goel publishing house ; 200-203, 1-4.
3) U.S. Pharmacopoeia. United States Pharmacopoeial Convention, Inc. (1994); 1982-84.

4) International Conference on Harmonization. Draft Guideline on Validation of Analytical Procedures 1995: Definitions and Terminology. Federal Register. 60: 112-160.
5) Reviewer Guidance, Validation of Chromatographic Methods 1994, Center for Drug Evaluation and Research, Food and Drug Administration. .
6) Guideline for Submitting Samples and Analytical Data for Methods Validation, 1987. Food and Drug Administration.
7) Bekett A.H.,Stenlake J.B. Practicle Pharmaceutical chemistry.2004, 4th edition. CBS Publishers New Delhi; Part-II: 275-314.
8) Kemp W. Organic Spectroscopy. 2nd edition. ELBS publication (1989); 194.
9) Chatwal and Anand. Instrumental methods of chemical analysis. 2007, 5th edition. Himalaya Publishing House ; 2.149-2.150.
10) Sharma B.K., in: Spectroscopy. 6thedition.Goel Publication Co. Meerut (1983); 1.
11) 12. Tony Owen. Fundamentals of modern UV-visible spectroscopy 2000. Agilent technologies. 73.
12) The Merck index, 13th edn., Merck and Co Inc., White house station, N.J., USA ,779.
13) Mathew, V.Das Gupta, R.E.Bailey . *Drug Dev. Ind. Pharm*. **(8) (**1995).
14) Ekpe, N and T.Jacobsen, *Drug Dev. Ind. Pharm*., **25(9),** 1057, (1999).