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A NOVEL METHOD FOR ESTIMATION OF FEXOFENADINE HYDROCHLORIDE IN BULK AND PHARMACEUTICAL PREPARATIONS BY VISIBLE SPECTROPHOTOMETRY

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ABSTRACT

A Simple and sensitive visible spectrophotometric method is described for the determination of Fexofenadine Hydrochloride in bulk and pharmaceutical preparations based on the formation of Blue color complex formed with cobalt thiocyanate exhibiting λ_{max} at 625nm. The Regression analysis of Beer's law plot showed good correlation in a general concentration range of 50-300µg/ml with correlation coefficient (r=0.999). The proposed method is validated with respect to accuracy, precision, linearity and limit of detection. The suggested procedure is successfully applied to the determination of the drug in pharmaceutical preparation, with high percentage of recovery. Good accuracy and precision. The results of analysis have been validated statistically by repeatability and recovery studies. The results are found satisfactory and reproducible. The method is applied successfully for the estimation of Fexofenadine in tablet form without the interference of excipients.

INTRODUCTION

Fexofenadine HCl (FFH), chemically designated as (±)-4-[1-hydroxy-4-(4-hydroxydiphenylmethyl)-1-piperidinyl]-butyl]-∝,∝-dimethyl benzeneaceticacid hydrochloride is a histamine H1 receptor antagonist used in patients with allergic rhinitis.The molecular weight is 538.13 and the empirical formula is C32H39NO4•HCl.FFH can be estimated by HPLC methods but no spectrophotometric method was reported in literature till date. Hence an attempt has been made to develop and validate a simple, economic rapid and accurate method. Some analytical methods which include HPLC, LC-MS and visible spectrophometric have been reported in the literature or the determination of FFH in pharmaceutical preparations. The main purpose of the present study was to establish a relatively simple, sensitive and validated visible spectrophotometric method for the determination of FFH in pure form and in pharmaceutical dosage forms, since most of the previous methods have been found to be relatively complicated and tedious. The proposed method based on the formation of coordination complex between durg and CTC. This method can be extended for the routine assay of FFH formulations.

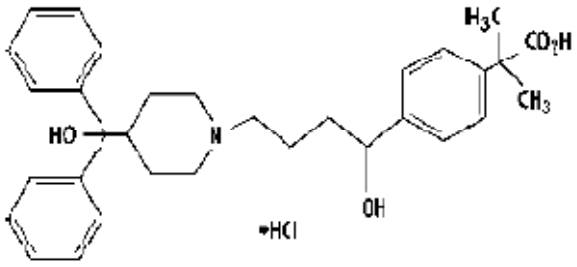


Fig 1: Showing chemical structure of FFH

MATERIALS AND METHODS

Apparatus and chemicals

A Shimadzu UV-Visible spectrophotometer 1601 with 1cm matched quartz cells was used for all spe4ctral measurements. All the chemicals use4d were of analytical grade Tablets were purchased from local market. CTC solution prepared by dissolving 7.25g of cobalt nitrate (BDH) and 3.8gm of ammonium thiocyanate (BDM) in 100m, of distilled water, nitrobenzene (Qualigens) used as it is. Buffer P^H 2.0 Solution prepared by mixing 25ml of potassium chloride solution (0.2M) and 13ml of HCL(0.2M) and made upto 100ml of distilled water were prepared.

Standard drug solution

The stock solution of drug was prepared by dissolving 100 mg in 100 ml distilled water. A portion of this stock solution was diluted stepwise with the distilled water to obtain the working

standard drug solution of concentrations of 100 µg/ml. from the stock solution, a series of standards were freshly prepared during the analysis day.

Preparation of sample solution.

Twenty tablets were weighed and finely powdered. A quantity of tablet powder equivalent to 100 mg of FFH taken in volumetric flask (100 ml) was shaken with methanol (10.0 ml) for 10 min and the volume was made upto the mark with distilled water. The solution was then filtered through whatman filter paper and the aliquot portion of the filtrate was diluted to 100.0 ml with distilled water to get sample solution.

Assay:

Aliquots of standard FFH solution (1.0-5.0ml,500µg/ml) were delivered into a series of 125 ml separating funnels. Then 3.0 ml of P^{Hs} 2.0 buffer solution and 7.0 ml of CTC solution were added and the total volume of aqueous phase in each funnel was adjusted to 15.0 ml with distilled water. To each separating funnel, 10 ml of nitrobenzene was added and the contents were shaken for 2 min. The two phases were allowed to separate and the absorbance of the separated nitrobenzene layer was measured immediately at 625 nm against a similar reagent blank. The colored species was stable for 1 hr . The amount of FFH present in sample solution was calculated from its calibration graph.

RESULTS AND DISCUSSION

In developing this method, a systematic study of the effects of various parameters were undertaken by varying one parameter at a time and controlling all others fixed. The effect of various parameters such as time, temperature, volume and strength of (CTC, Nitrobenzene) reagents, order of addition of reagents on color development and solvent for final dilution of the colored species were studied and the optimum conditions were established. Other water miscible solvents like methanol, ethanol, propan-2-ol and acetonitrile were found to provide no additional advantage. The optical characteristics such as Beer's law limit, Sandell's sensitivity, molar absorptivity, percent relative standard deviation (calculated from the six measurements containing $3/4^{th}$ of the amount of the upper Beer's law limits), Regression characteristics like standard deviation of slope ($S_{b)}$, standard deviation of intercept (S_a), standard error of estimation (S_e) and % range of error (0.05 and 0.01 confidence limits) were calculated and are shown in Table-1.

Commercial formulations containing FFH were successfully analyzed by the proposed method. The values obtained by the proposed and reference method (reported UV method in methanol, λ_{max} 289nm) for formulations were compared statistically by the t-and f-test and found not to differ significantly. As an additional demonstration of accuracy, recovery experiments were

performed by adding a fixed amount of the drug to the preanalyzed formulations at three different concentration levels. These results are summarized in Table-2. The ingredients usually present in formulations of FFH did not interfere with the proposed analytical method.

Chemistry of colored species:

In the present investigation of FFH functions as a donor due to the presence of cyclic tertiary nitrogen in pipperidene portion. The method is based on the formation of coordination complex between drug and CTC. In order to establish optimum conditions for the formation of complex between drug (electron donor) and CTC, the author has studied the various parameters such as type of buffer, Ph and volume of the buffer, shaken time, concentration and volume of CTC, volume of aqueous phase, organic solvent for extraction, stability of colored complex formed by varying one and fixing the other parameters . The formation of colored species with these reagents may be assigned through above analogy as shown in Figure 2.

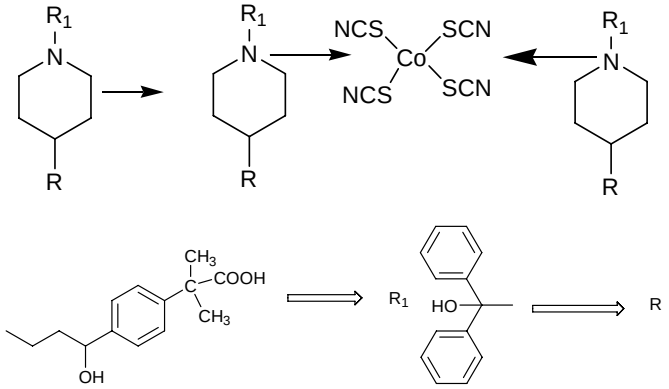


Fig 2: Probable scheme for proposed method

CONCLUSION

The reagents utilized in the proposed method are cheap and readily available and the procedure does not involve any critical reaction conditions or tedious sample preparation. The proposed analytical method is validated as per ICH guide lines and possess reasonable precision, accuracy, simple, sensitive and can be used as alternative method to the reported ones for the routine determination of FFH depending on the need and situation.

Table 1: Optical characteristics, precision and accuracy of proposed method.

Parameters	Values
λ_{max} (nm)	625
Beer's law limit (µg/ml)	500-300
Sandell's sensitivity (µg/cm^2/0.001 abs. unit	1.1304
Molar absorptivity (Liter/mole/cm)	2.9791x10^4
Regression equation	
(Y)*= a+bc	
Intercept(a)	0.0002
Slope (b)	0.002
%RSD	0.342
%Range of errors (95% Confidence limits)	
0.05 significance level	0.394
0.01 significance level	0.716

Y*=a+bc ; where y=absorbance. C= concentration of FFH in µg/ml.

Table 2: Analysis of FFH in pharmaceutical formulations by proposed and reference methods.

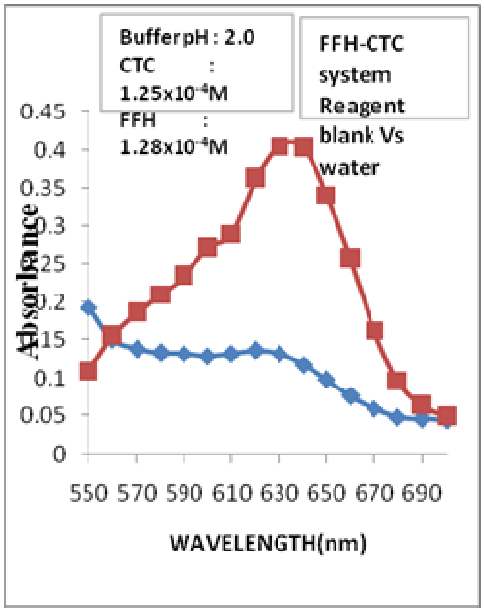
Method	*formulations	Labled Amount(mg)	Found by proposed Methods			Found by Reference Method ± SD	#% Recovery by proposed Method ± SD
			**Amount found ± SD	t	F		
CTC	Tablet-1	60	59.58±0.114	0.186	1.538	59.58±0.142	99.31±0.190
	Tablet-2	60	59.65±0.219	0.287	1.316	59.65±0.191	99.43±0.364

*Tablet 1 and Tablet 2 from two different companies

**Average ± standard deviation of six determinations, the t- and f-values refer to comparison of the proposed

#Recovery of 10mg added to the pre analyzed sample (average of three determinations).

Reference method (reported UV method) using methanol (λ_{max}=289nm).



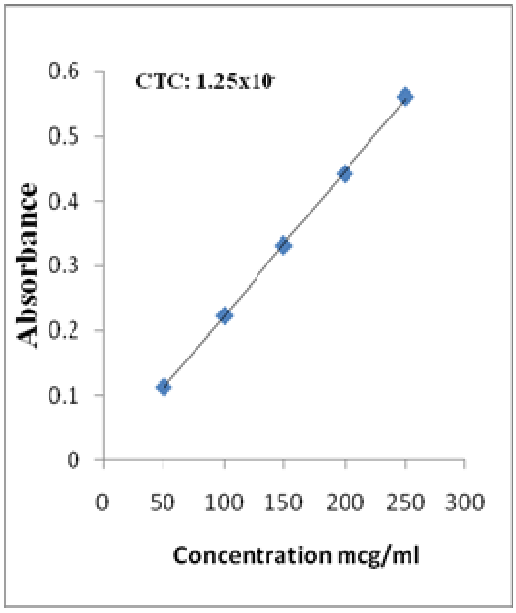


Fig 3: Absorption spectra of FFH with CTC Fig 4:Beers law plot of FFH with CTC and its reagent blank

REFERENCES

1. Goodman,L.S and Gilman, A.g., "The Pharmacological basis of therapeutics" 9th Edn., By Hardman, J.G., Limibrd, L.E., Editors in Chief,Me Graw-Hill,1996
2. Wolff, M.E., edt, "Burger's Medicinal Chemistry", Part IV, 4th Edn., Wiley Inter Science, New York,1981
3. Deorge,R.F., edt., "Wilson and Gisvold's text book of Organic and Medicinal and Pharmaceutical Chemistry",9th Edn., Lippincott Company,1991.
4. Korolkovas,A., "Essentials of Medical Chemistry, 2nd Edn., Wiley Inter Science, New York,1998.
5. "Pharmacopoeia of India", Ministry of Health and Family Welfare, Controller of publications,Delhi,Vol.1&2,1996
6. "British Pharmacopoeia",HMSO,London,2000 CD-ROM.
7. "British Pharmacopoeia (veterinary)" HMSP,Printed at UK,1995.
8. "United States Pharmacopoeia", USP24, USP Convention Inc. Rockville,2000.
9. "European Phamacopoeia",3rd Edn., Council of Europe,Strasbourg, 1997 (supplement 1999).
10. The complete drug reference, Martindale Extra Pharmacopoeia, 33rd Edn., The Pharmaceutical press, London,2002.
11. "The Merck Index",13th Edn., Merck &Co.Inc., NewYork,2001.
12. "Japan Pharmacopoeia", 13th Edn., 1996.
13. "Remington's the Science and Practice of pharmacy",19th Edn.,1995.
14. "Physicians Desk Reference",54th Edn.,2000.
15. Willard,H.H., merit,L.L.Jr., Dean,J.A and Settle,F.A.Jr.,"Instrumental methods of analysis" 6th Edn., CBS publishers, New Delhi,1986.
16. Day,R.A and Underwood, A.L., "Quantitative Analysis"5th Edn., Prentice Hall, New Delhi, 1986.