NOTE

Extractive Spectrophotometric Determination of Promethazine Hydrochloride

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Two simple, sensitive, rapid and accurate extractive spectrophotometric methods have been developed for the estimation of promethazine hydrochloride in tablet forms. In first method, absorbance of promethazine hydrochloride-Eriochrome black-T complex was measured at 520 nm (λ_{max}). Second method is based on the formation of promethazine hydrochloride-calcon complex having maximum absorbance at 540 nm. The proposed methods were validated statistically and by recovery studies. The linearity was found to 1.2-10.5 and 2.0-14.0 µg/mL for first and second method, respectively.

Key Words: Extractive spectrophotometry, Eriochrome black-T, Promethazine hydrochloride, Calcon.

Chemically promethazine hydrochloride is 2-RS-N,N-dimethyl-1-(10H-phenothiazin-10-yl)propan-2-amine hydrochloride. It exists in various enantiomeric forms and official in various pharmacopoeias[1-3]. The official method involves non-aqueous titrimetry and spectrophotometry in UV-region. Various methods has been developed[4,5] for its determination which include titrimetry[6-9], flurometry[10], chemiluminisence[11], voltametry[12,13], flow injection spectroscopy[14], chromatography[15], HPLC[16], polarography[17], *etc*.

Various spectrophotometric and colorimetric method involved the reaction of promethazine hydrochloride with number of chromogenic reagents[18-22]. No extractive spectrophotometric method has been reported for the estimation of promethazine hydrochloride using Eriochrome black-T and calcon as a chromogenic reagent. The objective of the present work was to develop simple extractive spectrophotometric methods that can be used for the routine analysis of the drug in tablets.

A systronic moel 118 double beam UV-Visible spectrophotometer with a pair of 10 mm matched quartz cells was used to measure absorbance of the resulting solutions, K-Roy analytical balance, Digital pH meter, double glass-distilled water, chloroform, dilute hydrochloric acid were also used in the study.

Preparation of standard solution: The purity of promethazine hydrochloride supplied by Sigma chemicals was checked by non-aqueous titration method[23]. A stock solution (1.0 mg/mL) was prepared in dilute hydrochloric acid solution. From these stock solutions, working standard solution (4 µg/mL) was prepared by appropriate dilutions with dilute hydrochloric acid

solution. Eriochrome black-T and calcon solutions were prepared by dissolving 0.360 and 0.325 g, respectively in dil. HCl and diluted it further ten times to obtained working reagent solutions.

Simple extractive spectrophotometric method: In each of series of separating funnels an appropriate aliquots of standard promethazine hydrochloride solution, Eriochrome black-T solution were added to make up the final volume of 10 mL. These aliquotes were vigorously shaken for 0.5 h, in five instalment of 2 mL chloroform each. The extracted chloroform layer was passed through anhydrous sodium sulphate in standard volumetric flask. The absorbances of extracted chloroformf layer were measured at 520 nm against reagent blank and calibration curve was plotted. Similar determinations were made with calcon solution at 540 nm in place of Eriochrome black-T solution.

Estimation from tablets: 20 Phenargan tablets obtained from market were weighed and ground to fine powder. An amount of powder equivalent to 10 mg of drug was transferred to 250 mL flask. Dilute HCl was added to it and were shaken throughly for about 10 min. The volume was made up with the same HCl solution and filtered. A suitable aliquote was extracted using the same procedure described earlier to estimate drug content in tablets. The concentration of drug in tablet was calculated using calibraton curve of pure drug. The optical characteristics and results of error analysis are given in Tables 1 and 2.

TABLE-1
OPTICAL CHARACTERISTICS OF PROMETHAZINE HYDROCHLORIDE

PARAMETER		METHOD	
		EBT	Calcon
λ_{max} (nm)		520	540
Beer's law limits (μg/mL)		1.2-10.5	2.0-14.0
Molar absorptivity (L mol^{-1} cm^{-1}) $\times 10^4$		1.77118	1.84195
Sandell's sensitivity (μg cm^{-2}/0.001 absorbance unit)		0.02226	0.01731
Regression equation (Y*)	Slope (a)	0.0551	0.0607
	Intercept (b)	-0.0001	-0.0016
Correlation coefficient (r)		0.9975	0.9911

Y* = ax + b, where x is concentration of PMH, μg/mL and Y is the absorbance.

TABLE-2
EVALUATION OF ACCURACY AND PRECISION DATA FOR
DETERMINATION OF PROMETHAZINE HYDROCHLORIDE

Method	Labelled drug (mg/Tab)	Amount drug found (mg/Tab)	Recovery (%)	Error (%)	RSD (%)	SD
EBT	10	9.9585	99.5850	-0.4146	0.09810	±0.0977
Calcon	10	9.8639	98.6398	-1.3602	0.39195	±0.3866

Eriochrome black-T and calcon readily forms ion-pair complexes with promethazine hydrochloride. The complexes are almost insoluble in water and are precipitated out in aqueous soluton when the drug and dyes are mixed. The

complexes are appreciably soluble in chloroform and hence can be easily extracted out by this solvent. Interestingly, the drug and both the dyes are not individually soluble in chloroform, therefore, even though a large excess of dyes has been used to ensure complete complexation of the drug, the excess dyes do not interfere with the extraction of the complex into the chloroform.

The ion-pair complexes have broad absorption spectra with λ_{max} at 520 and 540 nm. Since the λ_{max} are distinctly in the visible region, the spectrophotometric estimation of even low conentrations of the ion-pair complexes may determine. The Beer's law plots are found to be satisfactorily linear over the range of 1.2-10.5 µg/mL and 2.0-14.0 µg/mL in the case of Eriochrome black-T and calcon, respectively. These ion-pair complexes are intensely coloured and have large values for the molar absorptivities, namely 1.77×10^4 L mol^{-1} cm^{-1} for Eriochrome black-T and 1.84 L mol^{-1} cm^{-1} in case of calcon. Such large values of molar absorptivities enables very low concentrations of drug to be determined accurately.

The proposed methods are simple, fast accurate and reproducible and can be used for routine quality control analysis of promethazine hydrochloride from their formulations.

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