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SPECTROPHOTOMETRIC DETERMINATION OF CHLORPHENIRAMINE MALEATE AND PHENYLPROPANOLAMINE HYDROCHLORIDE USING "MULTIWAVELENGTH SPECTROSCOPIC METHOD"

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Abstract: With the help of UV Spectrophotometer a rapid and simple method for simultaneous determination of Chlorpheniramine Maleate (CPM) and Phenylpropanolamine Hydrochloride (PPM) by **"**Multi wavelength Spectroscopy**"** has been developed in combined pharmaceutical dosage forms. The proposed method was successfully applied for the determination of drugs in physical mixture and commercial formulations. The earlier methods developed for simultaneous determination of Chlorpheniramine Maleate and Phenylpropanolamine Hydrochloride in combined pharmaceutical dosage forms were expensive and time consuming, so these studies may serve as a basis for simultaneous analysis of CPM and PPM in combined pharmaceutical dosage forms having results of good linearity, precision and reproducibility.

Key Words: Derivative, UV absorption, spectral overlap, principle maxima, wavelength range, analytical signal

INTRODUCTION

Combinations of two or more drugs in the pharmaceutical dosage forms are very much useful in multiple therapies. Market survey revealed that, day by day new drugs and their combination with another drugs are being introduced in market as they have more patient compliance than a single drug. The analytical chemistry hence has challenge in developing the methods for their analysis with the help of number of analytical techniques which are available for the estimation of the drugs and their combination. Analytical monitoring of pharmaceutical product or specific ingredients within the product is necessary to ensure its safety and efficacy throughout the shelf life, including storage, distribution and use.[1,2]

Chlorpheniramine maleate inhibits the effects of histamine on capillary permeability and bronchial smooth muscles. It is an anti-allergic drug, widely used in cough and cold preparations. Phenylpropanolamine (PPM) is indirectly acting sympathomimetic agent and is used in the symptomatic relief of nasal congestion. These drugs are either used alone or in combination. Besides the various official methods (IP & USP) the other analytical methods available in literature for determination of chlorpheniramine maleate,[3-11] phenylpropanolamine hydrochloride[12-19] and combination of chlorpheniramine maleate & phenylpropanolamine hydrochloride[20-22] have been mentioned. These methods are time consuming; therefore an alternative method of multi wavelength spectroscopy by UV spectrophotometry is rendered.

MATERIAL AND METHODS

The simultaneous determination of CPM and PPM is not possible by direct UV absorption measurement method because of spectral overlap of their principal maxima. "The absorbance difference between two points on the mixture spectra is directly proportional to the concentration of the component of the interest independent of interfering components". The present work was undertaken to develop such method of analysis, which is a precise, accurate, simple, reliable and less time consuming method for estimation. Authentic samples of CPM and PPM were provides as a gift samples from M/S Plethico Pharmaceutical, Indore.

Precise Description of Solvent and Linearity Studies

The common Solvent distilled water was used for simultaneous estimation of PPM and CPM using multi wavelength method. The drug solutions obey the Beer's Law in the working range of concentrations i.e. 0-28 mcg/ml for CPM and 0-175 mcg/ml for PPM.

Preparation of Stock Solutions

The stock solutions of PPM and CPM were prepared by weighing 25mg of PPM and 10mg of CPM separately and transferred to 100ml volumetric flasks separately. Each drug was dissolved in about 60ml of distilled water and finally the volume was made up to the mark with distilled water. The standard drug solutions of 100 mcg/ml of CPM and 250 mcg/ml of PPM were obtained.

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Selection of Sampling Wave Lengths for Simultaneous Analysis

By appropriate dilutions of the standard drug solutions with distilled water, solution containing 40 mcg/ml of CPM and 250 mcg/ml of PPM were prepared separately. The overlain spectra of both the solutions were recorded by scanning between 325-200 nm Figure (1). From the spectra, the wavelengths which would be utilized for simultaneous analysis of PPM and CPM using the multicomponent mode, were 257 nm (absorbance maxima for PPM) and 268 nm (another minor absorbance maxima for CPM).

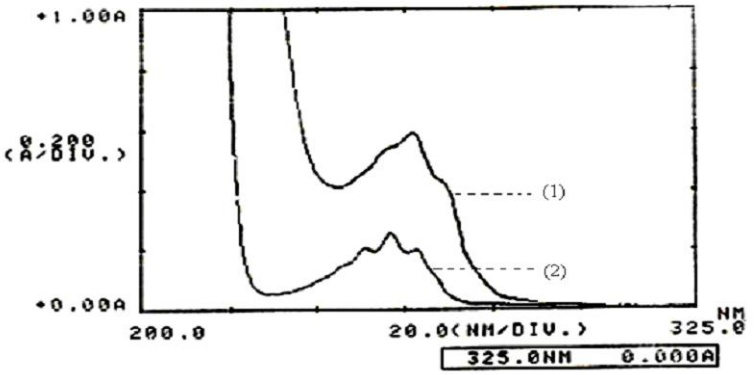

Figure 1: Normal overlain spectrum of CPM (1) and PPM (2).

Selection of Number of Mixed Standards

Trials with mixed standards containing the two components in the ratio of 1: 6.25 (CPM: PPM) were rationally experimented keeping in view the concentration of two drugs in the available formulations. The results were found satisfactory. After above experimentation, six mixed standards were selected for quantitative analysis. The stock solution of 100 mcg/ml CPM and 250mcg/ml PPM were used for preparation of mixed standards. The concentration of each component is shown in the Table no. 1

Table 1: Concentrations of CPM and PPM used for Preparation of Mixed Standards.

Standard no.	i.	ii.	ii.	v.	v.	vi.
Conc. Of CPM mcg/ml.	8	12	16	20	24	28
Conc. Of PPM mcg/ml	50	75	100	125	150	175

Standardization of Proposed Method by Analysis of Authentic Samples

Six mixed standard were prepared as per the table no 1. The sample solutions were prepared to keep CPM: PPM ratio 1: 6.25 the sampling wave lengths and concentration of each component in the six mixed standards were provided to the instrument using the multicomponent mode. Subsequently all the mixed standards were scanned in the range of 300-220 nm. The instrument collected and compiled spectral data from the mixed standards and was ready for the quantitative analysis of samples. The sample solutions were scanned between the above ranges (300-220 nm). The concentration of each of the component in the sample solutions were printed out by the instrument. The results of the analysis are given in the Table no. 2.

Table 2: Results of CPM and PPM by Analysis of Authentic Samples

S. NO.	Expected Conc. mcg/ml		Found Conc.mcg/ml.		Percent Found	
	CPM	PPM	CPM	PPM	CPM	PPM
i.	10	62.5	10.201	62.010	102.01	99.21
ii.	14	87.5	13.912	87.232	99.37	99.69
ii.	16	100.0	15.701	100.952	98.13	100.95
v.	18	112.5	18.190	115.110	101.05	102.31
v.	22	137.5	22.721	140.929	103.27	102.49

Procedure for Analysis of Commercial Formulations

For preparation of stock solution twenty tablets were weighed and the average weight was found (243.26 mg: labeled to claim 4 mg of CPM and 25 mg of PPM). The tablets were crushed to powder form and 243.26 mg powder was weighed and transferred to 100 ml volumetric flask. 50 ml of distilled water was added and it was shaken for 10 minutes for complete dissolution of drugs. Filtered, using whatman filter paper no. 44. The final volume was made up to the mark. The final solution labeled to claim 40 mcg/ml of CPM and 250 mcg/ml of PPM.

From the stock solution different dilutions were prepared and used as unknown. The unknown solution was analyzed by multicomponent mode of the instrument. The overlain spectra of the six mixed standards used for analysis are shown in figure 2. The results of analysis of commercial Samples are recorded in Table No. 3 and 4 respectively.

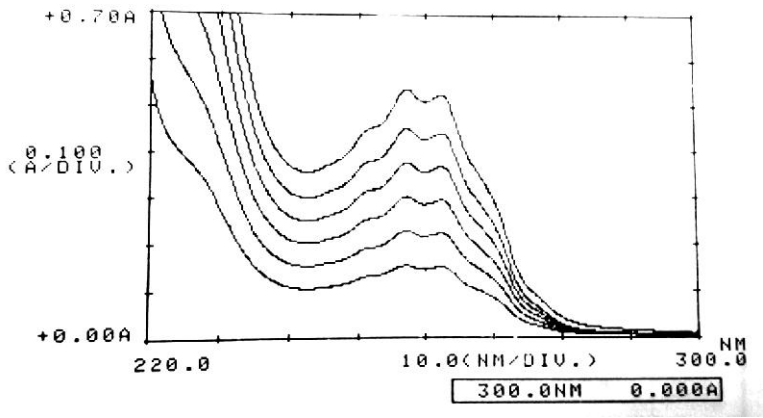

Figure 2: The overlain spectra of the six mixed standards

Table 3: Results of CPM and PPM by Analysis of Commercial Samples

S.No.	Expected Conc. mcg/ml		Found Conc. mcg/ml		Percent found	
	CPM	PPM	CPM	PPM	CPM	PPM
i.	8	50	7.842	51.231	98.02	102.46
ii.	12	75	12.105	75.048	100.87	100.06
ii.	16	100	15.782	101.23	98.63	101.23
v.	20	125	20.223	124.978	101.11	99.98
v.	24	150	24.017	152.08	100.07	101.38

Recovery Studies

A pre-analyzed 3 ml solution containing 12 mcg/ml of CPM and 75 mcg/ml of PPM were used for recovery studies by addition of standard solutions of different concentrations of CPM and PPM as per Table No. 4. These solutions were scanned between 220-300 nm by using 257 and 268 nm wavelengths in multicomponent mode of instrument. Results of recovery studies are shown in table no 4 and 5.

Table 4: Statistical Estimation of results of CPM and PPM in Recovery Studies, Authentic and Commercial Samples.

Analytes	Mean	Standard deviation	Standard error	Co-efficient of variation
Authentic sample				
PPM	100.93	1.3292	0.5944	1.3169
CPM	100.766	1.8328	0.8196	0.8196
Commercial samples				
PPM	101.022	0.9220	0.4123	0.9127
CPM	99.74	1.2209	0.5460	1.2241

Table 5: Results of CPM and PPM by Analysis of Recovery Studies Samples

S.No.	Conc. added to table solution mcg/ml.		Recovered mcg/ml.		Percent Recovered	
	CPM	PPM	CPM	PPM	CPM	PPM
i.	8	25	7.904	24.991	98.8	99.96
ii.	6	50	5.872	50.014	97.86	100.02
iii.	7	60	6.921	59.023	98.87	98.37
iv.	4	75	4.102	75.120	102.55	100.15

RESULTS AND DISCUSSION

In the present research work an attempt has been made to develop simple method of analysis for combination of phenylpropanolamine hydrochloride and chlorpheniramine Maleate as literature review revealed that no other simple reported method except HPLC, which require sophisticated instrument and HPLC grade solvents. This method presented above utilizes the absorbance of ultraviolet radiation by PPM and CPM, distilled water was the solvent employed for this method. This method is advantageous as require less memory capacity for storage of calibration data as well as less time consuming as compare to multicomponent analysis by other instruments.

CONCLUSION

Multi wavelength technique utilizes the multicomponent mode of instrument. The use of six mixed standards and two sampling wavelengths of 257 nm (absorbance maxima of PPM), 268nm (absorbance maxima of PPM) gave optimum accuracy, reproducibility and least time consuming. The values of standard deviation for both CPM And PPM were found between 0.7-1.8 and recoveries of drug added were found to be between 97-103% which are quiet impressive.

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