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UV Spectrophotometric Methods for Estimation of Chlorpheniramine Maleate (CPM) In Pharmaceutical Dosage Form by Absorption Maxima Method and Area under Curve

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ABSTRACT

A new, simple, rapid and novel spectrophotometric method has been developed for estimation of CPM. For this Absorption maximum Method (method A) and Area under Curve Method (Method B) is used. The method involved measurement of absorbance at wavelengths 261 nm for method A and method B involved measurement of area under curve in the wavelength range 245-267 nm for CPM. Beer's law obeyed in concentration range of 5 to 50 µg/mL by both the methods. The proposed methods are recommended for routine analysis since they are rapid, simple, accurate and also sensitive and specific. The results obtained are reproducible with a coefficient of variation less than 2%. These methods were validated for precision, reproducibility, linearity and accuracy as per ICH guidelines.

Keywords: Chlorpheniramine Maleate, Absorption Maxima Method, Area under curve, UV Spectrophotometer.

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INTRODUCTION

CPM is chemically 1-(N, N-Dimethylamino)-3-(p-chlorophenyl)-3-(alpha-pyridyl) propane maleate **(Fig. No.1)**. CPM is a first-generation alkyl amine antihistamine used in the prevention of the symptoms of allergic conditions such as rhinitis and urticaria. Its sedative effects are relatively weak compared to other first-generation antihistamines. Chlorpheniramine binds to the histamine H1 receptor. This blocks the action of endogenous histamine, which subsequently leads to temporary relief of the negative symptoms brought on by histamine. [1-4, 9, 10]

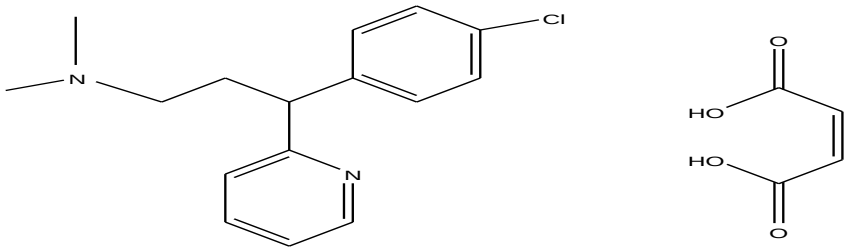

Fig 1: Structure of CPM.

MATERIAL AND METHODS

Instrumentation:

A Shimadzu double beam UV–visible spectrophotometer, Model: U V-1800, with a fixed bandwidth (2nm) and 1-cm quartz cell was used for spectral and absorbance measurements. In addition, electronic balance and sonicator were used in this study.

Reagents and chemicals:

Working standards of pharmaceutical grade CPM (Batch no. 043/0112) was obtained as generous gifts from AGIO Pharma Limited, MIDC, (Pune, Maharashtra, India). It was used without further purification and certified to contain 99.79 % on dry weight basis for CPM. Fixed dose combination tablet CPM (Galaxy Pharma) containing 4 mg CPM was purchased from local market, Pune, Maharashtra, India. Glass double distilled water was used throughout the experiment.

Preparation of standard stock solutions:

CPM (10 mg) were accurately weighed and dissolved separately in 100 mL of distilled water to give stock solution (100 µg/mL). Further dilutions were made from standard stock solution in the concentration range 5, 10, 15, 20, 25, 30, 35, 40, 45 and 50 µg/mL and calibration curve was prepared.

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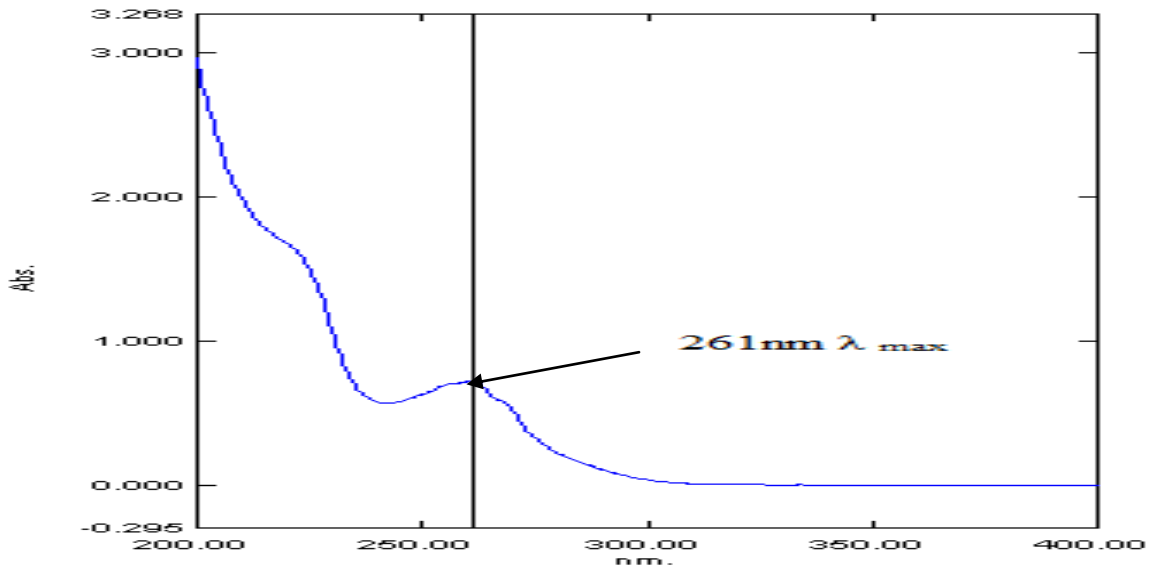
Method A: Absorption Maxima Method

For the selection of analytical wavelength, 45 µg/mL of CPM was prepared by appropriate dilution of standard stock solution and scanned in the spectrum mode from 400 nm to 200 nm. From the spectra **(Fig. No. 2**) of drug of CPM, λmax 261 nm was selected for the analysis. The calibration curve was prepared in the concentration range of 5-50 µg/ mL at 261 nm. By using the calibration curve, the concentration of the sample solution was determined. The result shown in **Table no.1.**

Table 1: Results of Analysis of Tablet Formulation. (Method A)

Drug	Lot	Drug found (mg per tablet)	
		Mean ± SD (n= 6)	Recovery (%)
CPM (4 mg)	1st Lot	3.99±0.94	99.75
	2nd Lot	3.98±0.43	99.50

Fig 2: Overlain spectrum of CPM.V



Method B: Area under curve

For the determination using the area under curve (AUC) method, suitable dilutions of the standard stock solutions of CPM were prepared in distilled water. The solution of drug was scanned in the range of 200-400 nm. From the spectra **(Fig. No.3)** of drug λmax for estimation of CPM 245-267nm was selected for the analysis. The calibration curve was plotted in the concentration range of 5-50 µg/mL. This showed linear response with increasing concentration hence the same wavelength range was used for estimation of tablet formulations. The result shown in **Table no.2** [6-8]

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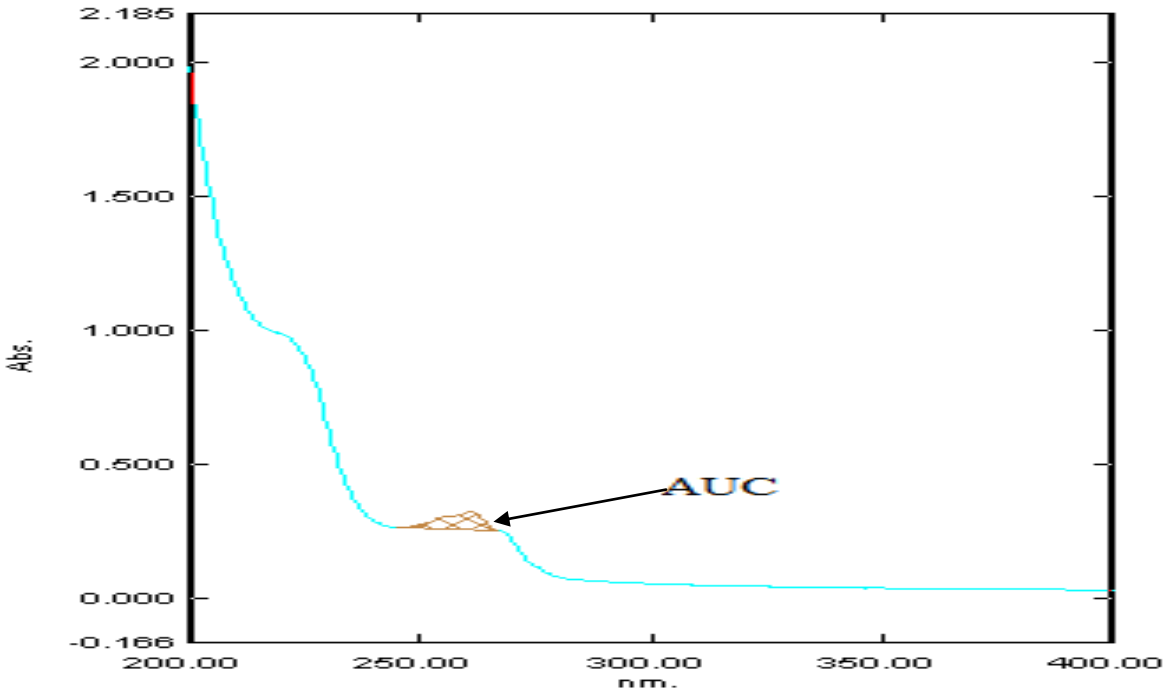
Table 2: Results of Analysis of Tablet Formulation. (Method B)

Drug	Lot	Drug found (mg per tablet)	
		Mean ± SD (n= 6)	Recovery (%)
CPM (4 mg)	1st Lot	3.98±0.94	99.50
	2nd Lot	3.94±0.43	98.50

Fig 3: AUC Spectrum of CPM.



RESULTS

Method validation [5]

The Method was validated as per ICH guidelines using different parameters and statistical data was shown in **Table No.3**.

Table 3: Spectrophotometric characteristics and statistical data of the regression equations

Parameter	Method A	Method B
Beer's rangs (µg/mL)	5-50	5-50
Estimated on wavelength (nm)	261	245-267
Limit of Detection (µg/mL)	4	4
Limit of Quantitation (µg/mL)	3	3
Intercept	0.012	0.043
Slope	0.016	0.038
Correlation coefficient(r)	0.999	0.998

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Linearity:

The linearity was evaluated by analyzing different concentration of standard solution of CPM. The Beer Lambert's law was obeyed in the concentration range of 5-50µg/ mL for both methods with regression coefficient of 0.999 and 0.998 for method A and method B respectively.

Limit of Detection and Limit of Quantitation:

LOD and LOQ were calculated from the data obtained from the linearity studies. The slope of the linearity plot was determined. For each of the six replicate determinations, y intercept was calculated and the standard deviation of the y intercept was computed. From these values, the parameters Limit of Detection (LOD) and Limit of Quantitation (LOQ) were determined on the basis of response and slope of the regression equation. The result was given table no1.

Precision:

The reproducibility of the proposed method was determined by performing tablet assay at different time intervals (morning, afternoon and evening) on same day (Intra-day assay precision) and on three different days (Inter-day precision). Result of intra-day and inter-day precision is expressed in % RSD **(Table No. 4&5)**.

Table 4: Precision study of CPM (Method A)

Conc. (µg/ml)	Repeatability (n=6)			Intermediate precision (n=6)		
	Measured conc. ±SD	(%) RSD	Recovery (%)	Measured conc. ±SD	(%) RSD	Recovery (%)
10	10.08±0.69	6.38	100.8	9.98±1.02	10.2	99.8
20	19.78±1.5	7.58	98.9	20.04±0.4	2	100.2
30	29.98±0.90	3.002	99.93	29.50±1.1	3.66	98.33

Table 5: Precision study of CPM (Method B)

Conc. (µg/ml)	Repeatability (n=6)			Intermediate precision (n=6)		
	Measured conc. ±SD	(%) RSD	Recovery (%)	Measured conc. ±SD	(%) RSD	Recovery (%)
10	10.05±0.50	5	100.1	9.98±1.05	10.5	99.8
20	19.08±1.02	5.1	95.4	20.5±1.50	7.5	102.50
30	2905±0.70	2.33	96.93	29.02±0.8	2.66	96.73

Accuracy:

Accuracy of an analysis was determined by systemic error involved. Accuracy may often be expressed as % Recovery by the assay of known, added amount of analyte. It is measure of the exactness of the analytical method. Recovery studies carried out for both the methods by

spiking standard drug in the powdered formulations 80%, 100%, 120% amount of each dosage content as per ICH guidelines**(Table No. 6&7)**.

Table 6: Recovery data of CPM (Method A)

Label claim (mg/tab)	Amount Added (mg)	Total Amount (mg)	Amount Recovered (mg) ± % RSD	Recovery (%)
4	3.2 (80%)	7.2	7.19±1.09	99.86
4	4 (100%)	8	7.98±0.89	99.75
4	4.8 (120%)	8.8	8.78±1.45	99.77

Table 7: Recovery data of CPM (Method B)

Label claim (mg/tab)	Amount Added (mg)	Total Amount (mg)	Amount Recovered (mg) ± % RSD	Recovery (%)
4	3.2 (80%)	7.2	7.19±1.09	99.86
4	4 (100%)	8	7.98±0.89	99.75
4	4.8 (120%)	8.8	8.78±1.45	99.77

DISCUSSION

The methods discussed in the present work provide a convenient and accurate way for analysis of CPM in its bulk and pharmaceutical dosage form. Absorbance maxima of CPM at 261 nm was selected for the analysis. Linearity for detector response was observed in the concentration range of 5-50 µg/mL for CPM. Percent label claim for CPM in tablet analysis was found in the range of 99.75% and 99.50 %**.** Standard deviation and coefficient of variance for six determinations of tablet formulation, was found to be less than ± 2.0 indicating the precision of the methods. Accuracy of proposed methods was ascertained by recovery studies and the results are expressed as % Recovery for CPM was found in the range of 99.79% values of standard deviation and coefficient of variation was satisfactorily low indicating the accuracy of all the methods. % RSD for Intraday assay precision for CPM was found to be 1.03 and 0.74 for Method A and B. Inter day assay precision for CPM was found to be 0.84 and 1.11 for Method A and B. Based on the results obtained, it is found that the proposed methods are accurate, precise, reproducible & economical and can be employed for routine quality control of CPM bulk drug and its pharmaceutical dosage form.

CONCLUSION

In this study a simple, fast and reliable UV spectrophotometric method was developed and validated for the determination of CPM in pharmaceutical formulations. This method was applied directly to the analysis of pharmaceutical dosage forms without the need for separation of complex sample preparation such as extraction steps prior to the drug analysis. Thus the validated method is suitable and can be used for the routine analysis. A method for the estimation of CPM in pure drug, solid and suspension dosage forms has been developed. Statistical analysis proves that, these methods are repeatable and selective for the analysis of

CPM. It can therefore be concluded that use of these methods can save much time and money and it can be used in laboratories with accuracy.

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REFERENCES

[1] www.chemicalbook.com.
[2] www.druglead.com.
[3] www.wikipedia.com.
[4] www.DrugBank.com.
[5] ICH Q2 R1, Text on validation of analytical procedures, International Conference on Harmonization tripartite guidelines, adapted 27 June 1998.
[6] Nilam A. Gad have. IJPRD 2011; 3(4): 87–92.
[7] Adedibu C Tella, Ojeyemi M Olabemiwo, Musa O Malwi. IJPS 2010; 5(4): 379–382.
[8] Gopal Garg, Shailendra Saraf, Swarnlata Saraf. IJPER 2008; 42(1): 73-79.
[9] The Indian Pharmacopoeia. Controller publication New Delhi 2007; 2: 176-177.
[10] FSK BARAR. Essentials of Pharmacotherapeutics. First Edition 1985; 519-521.