ISSN: 0974-2115
www.jchps.com Journal of Chemical and Pharmaceutical Sciences

Colorimetric determination of Cefpodoxime proxetil by chelation with Mercury (Hg II) ions

G. Kamalesh*, Madhuri.D, G.Nagarajan, K.Manasa, E.V.S.Naveen, S.Mufissunisa
Department of Pharmaceutical Analysis, DR.K.V.Subbareddy Institute of pharmacy, Dupadu , Kurnool A.P.India
To whom correspondence should be addressed.
***Corresponding author: E.mail: kamaleshgd810@gmail.com**

ABSTRACT

A simple, sensitive and accurate Colorimetric method was described for the determination of Cefpodoxime Proxetil (CP) an antibacterial drug. The method is based on chelate formation between CP and Mercury (HgII) in aqueous media. The complex showed an absorption maximum at 420nm with apparent molar absorpitivity of 3.88x10 ^{4} L-M^{-1}Cm^{-1}.The solution of the complex obeyed beer's law in the concentration range of 2-20µg/ml . The limit of detection and Limit of quantification were calculated and RSD were calculated. The chelate composition between [CP and Hg (II)] ion was found to be 1:1 ratio determined by Job's continuous method and by Molar ratio method. The proposed method was applied for the determination of CP in tablets without interference from common excipients. The results obtained by the application of this procedure showed percentage recoveries were 99.8±0.1463.

Key words: Cefpodoxime Proxetil, Chelate, Aqueous media, Colorimetric.

INTRODUCTION

It is an antibacterial drug. It inhibits cellwall synthesis by inhibiting final transpeptidation step of peptidoglycan synthesis in cell wall. Inhibition of the enzyme topoisomerase II (DNA gyrase) and topoisomerase IV which are required for bacterial DNA replication, transcription repair and recombination.

Cefpodoxime proxetil is not official in Indian pharmacopeia, the literature studies of cefpodoxime proxetil was determined and approved certain analytical methods of RP-HPLC development and validation, UV visible spectrophotometric methods of simultaneous result of optimizing the parameters of accurate, precision, simple, linearity in both bulk drug formulations and combined dosage forms. Assay of drug has also been performed and have been reported

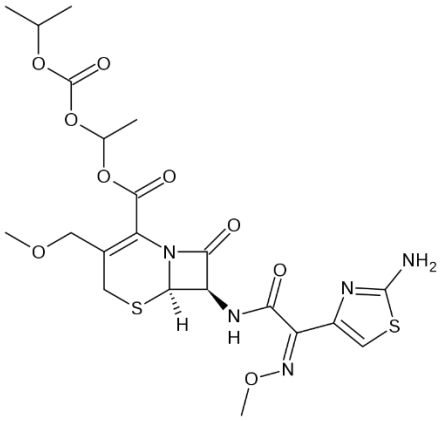

Figure.1.Molecular structure of Cefpodoxime proxetil

MATERIALS AND METHODS

All absorption Spectra were made using ELICO UV-Vis Spectrophotometer equipped with 10mm matched Quartz cells. 0.271 gm of Mercuric Chloride (AR, Merck Ltd) was dissolved by adding double distilled water and diluted by using double distilled water in 100ml standard flask and standardized. 55.7 mg of CP was transferred into a 100ml volumetric flask .It was dissolved and diluted up to the mark using methanol to get 1x10^{-3}M concentration of CP Solution. 10 mg of CP was transferred into a 100ml volumetric flask .It was dissolved and diluted up to the mark using methanol to get 0.1mg/ml concentration of CP Solution.

Chelation of CP with Hg (II): An aliquot of metal ion (usually 1 ml of 1 x 10 $^{-2}$ M) solution was taken in a 10-ml volumetric flask and the volume was made up to the mark with doubly distilled water. The absorbance of the solution was measured against blank. A plot was drawn between absorbance and the wavelength.

The following procedure was adopted for measuring the absorption spectra of chelate (metal + drug). In a 10-ml standard flask, the drug chelate was prepared by taking 1ml of $1X10^{-3}$M drug stock solution and suitably concentration of metal ion (usually 20-30 fold molar excess to drug) solutions. The contents were diluted up to the mark with doubly distilled water and the absorbance of the chelate was measured against the reagent blank prepared identically. A plot between absorbance and the wavelength was drawn from which the analytical wavelength was selected. (Fig 2).

Procedure for dosage form: An accurately weighed amount of finely powdered tablet equivalent to 100mg of drug was dissolved in about 10ml of methanol and transferred in to 100ml of calibrated volumetric flask after 15minutes of mechanical shaking was filtered into a 100ml of calibrated volumetric flask through Whatmann no: 41 filter paper, diluted to 100ml with methanol and the same procedure was followed as described above.

Optimum conditions:

Effect of pH: To arrive the optimum pH required for achieving the maximum and constant absorbance, the effect of pH on the absorbance of the mercury (II)-CP complex was studied by employing in a set of 10ml standard flasks, 3 ml of buffer (different pH values 1.0 to 11.0) solution, constant amount of drug and metal ion (usually 20- 30 fold molar excess to drug) solution were taken, made up to the mark with distilled water. The absorbance of each solution (metal complex) was measured at a selected wavelength (λ_{max}) against corresponding reagent blank prepared accordingly. A plot was made between absorbance and pH from which the working pH was selected. The complex shows constant absorbance without the effect of various pH conditions. Therefore, no buffer solution was chosen for further studies.

Effect of reagent concentration: To 1ml of $1x10^{-3}$ M CP stock solution, aliquots of 1.0 to 5ml of $1x10^{-2}$M reagent solution was added into 10 ml Volumetric flask and make up to the volume to 10ml with distilled water and the absorbance values at 420nm were noted. Investigation of metal ion concentration revealed that only thirty-fold molar excess of reagent was sufficient for optimum and maximum colour intensity of the chelate of CP using 55.7µg/ml concentration. (Figure.3.)

Effect of time: The absorbance of [CP-Hg (II)] complex was measured at different time intervals to ascertain the time stability of the complex. The full colour development of the complex remains constant for twenty four hours. Then the absorbance of [CP-Hg (II)] complex was measured at 420 nm.

Determination of chelate stability and composition: The composition of the chelate1 of [CP with Hg(II)] ion used was studied by Job's continuous method and Molar ratio method .The chelate of 1:1 ratio was obtained between CP and Hg(II).(Fig5-6)

Linearity range and quantification procedure: Beer's law was found to be obeyed in the concentration range of 2.0to 20µg/ml. Absorbance (1%, 1Cm) was calculated. The results were tabulated in Table.1.(Fig 4).

Assay of dosage form: An accurately weighed amount of finely powdered tablet equivalent to 100mg of drug was dissolved in about 10ml of methanol and transferred in to 100ml of calibrated volumetric flask, after 15minutes of mechanical shaking was filtered into a 100ml of calibrated volumetric flask through Whatmann no:41 filter paper and was diluted to 100ml with methanol and the same procedure was followed as described above. The results were tabulated in Table.2.

RESULTS AND DISCUSSIONS

The method was based on the chelation of the drug with Hg(II) which gave a pale yellow colour complex showing maximum absorbance at 420nm. The linearity range of CP-Hg(II) chelate covered over a range of 2.0-20 μg /ml of drug with A(1%,1cm)equals to $3.88x10^4$ L $Mole^{-1}cm^{-1}$.The drug chelate absorbance were plotted against the corresponding concentrations. Data were fitted to the equation Y=a+bx, where Y is the absorbance at relevant maximum is the Drug concentration in mcg/ml; 'b' is the slope 'a' and is the intercept of the calibration curve. The correlation coefficient is 0.999 indicating exact linearity. The Accuracy of the proposed procedure were 99.8%. Repeatability and reproducibility were evaluated. The limit of detection does not exceed 5.2 μg /ml whereas limit of quantification was 15.3μg /ml. Proposed procedure for CP is a stability indicating one which can be used for the determination without interference with the excipients. The drug being soluble in methanol and considered more selective drug to chelate with Hg(II) ion.

Table.1.Results of validation

Parameter	MFX-Hg(II) 420nm
Linearity range(µg/ml	2.0-20
LOD(mcg/ml)	0.33
LOQ(mcg/ml)	1.0
Slope	0.00
Intercept	0.096
Correlation coefficient	0.999
Accuracy	99.8.
Repeatability(n=6)RSD	0.1463

Table.2. Results of the determination of CP by the proposed method in their dosage form

Dosage form	Recovery % Assay
	[CP-Hg(II)] at 420nm
Vantin	99.8±0.5748; N=6
Monocef	99.6±0.49

a- Average of six determinations.

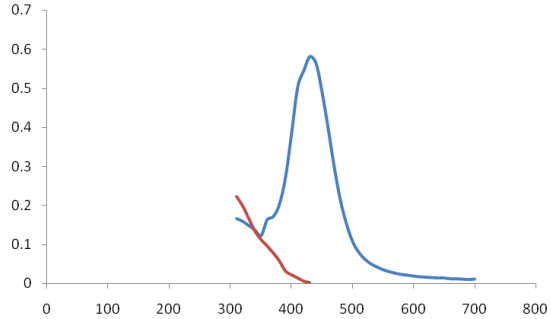

Figure.2.Absorption spectra of 55.7µg/ml CP complex with 1x10^{-2}M Hg(II)

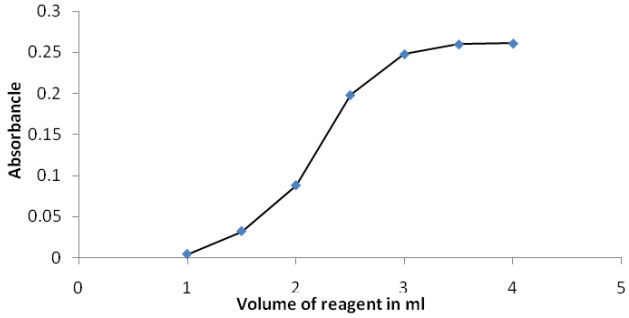

Figure.3.Effect of reagent concentration on the formation of CP complex with Hg(II)ion

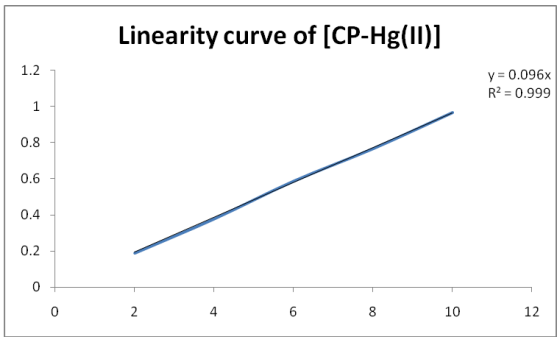

Figure.4.Beer's Plot of [CP-Hg(II)] at 420nm

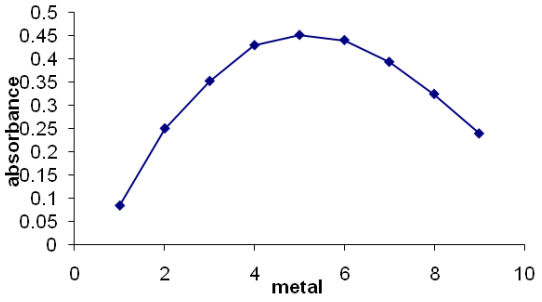

Figure.5.Job's method for CP complex with Hg(II) ion at 420nm

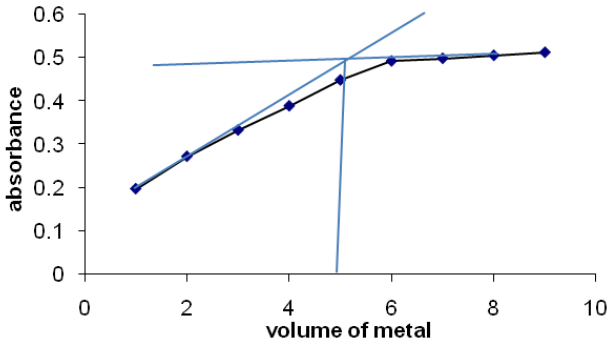

Figure.6.Mole ratio method for CP complex with Hg(II) ion at 420nm

CONCLUSION

The method described here is effective in determining Cefpodoxime Proxetil by using spectroscopic technique. Accuracy and reproducibility of the method suggests the usage of the method for the commercial usage of the method.

REFERENCES

Al-Ghannam SM, Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy, 69(4), 2008, 1188-1194.

Andrija Ciric, R.Jelic,L. Joksovic, M.Jelikic, Stankov, P.Djurdjevic, Canadian journal of analytical sciences and spectroscopy, 2007, 52(6), 2007, 343-350.

MartinaPongratz, PetraSchluga, MichaelA.Jakupee, Vladimu B.Arion, Christina Ra. hartinger, Gunter Allmaier and Benhard K.Keppler, J.Anal.At.Spectron, 19, 2004, 46-51.

Patel.M.S, Mehta.R.M, Dave B.J, Patel N.C, Spectrophotometric methods for Simultaneous Estimation of Cefpodoxime Proxetil and Ambroxol Hydrochloride in tablet Dosage form, IJPRS, 1(3), 2012, 195-203.

Sanjay K Motwani, Roop KK, Ahmad FJ, Shruthi C. Spectrochimica Acta part A; Molecular and Biomolecular spectroscopy, 68(2), 2007, 250.

Siddalinga Swamy, Satish Kumar Shetty, Anil Kumar, UV-Visible Spectrophotometric methods for the estimation of Cefpodoxime proxetil in bulk drug and Pharmaceutical dosage form, IJPTR, 4(2), 750-756.

Sunil singh, Nitin Dubey, Dinesh kumar Jain,Lalit kumar Tyagi, Mahendra singh, Spectrophotometric and RP-HPLC methods for simultaneous determination of Cefpodoxime Proxetil and Clavulanate Potassium in combined tablet dosage Form, American Eurasian Journal of Scientific Research Journal, 1(2), 2010, 88-93.